

Before The Aqueduct Commission.

IN THE MATTER

*of*

The Protest of THE MERCHANTS' ASSOCIATION against the payment of \$200,000 of the retained amount upon the contract of Messrs. McDonald & Onderdonk, for the Construction of the Jerome Park Reservoir.

BRIEF FOR THE MERCHANTS' ASSOCIATION,  
AND BRIEF IN REPLY TO BRIEFS SUBMITTED  
FOR CONTRACTORS AND ENGINEERS.

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**Brief for  
Merchants'  
Association.**

## **Preliminary Recital.**

More than eighteen months ago The Merchants' Association formulated and presented to Mayor Low its objections to the character of work done at Jerome Park Reservoir under the contract made by the Aqueduct Commission with Messrs. McDonald and Onderdonk. Its criticisms in brief are that specifications of the contract, have been violated in important particulars; that embankments have been built of improper material; that "rock dust", which consists of certain rock screenings to be more fully described later, were used in place of "clean, sharp sand, free from loam" in making mortar; that the heavy retaining wall which, at certain portions along the periphery of the westerly reservoir has been substituted for the core wall and embankment construction, leaks badly; that it is not a "water tight wall of



masonry" that this heavy leakage is in large measure due to the "rock dust" in the mortar; that the retaining wall is unfit for the purpose for which it was intended; that unnecessary excavation from solid rock has been made to the great advantage of the contractors in various places along the rock bottom, noticeably at Gate House 5, and in the rock formation back of the reservoir wall; that gross delay and negligence has marked the conduct of the work; that work upon Croton Aqueduct North was discontinued in the spring of 1900 or thereabouts, and had never been resumed; that the completion of this section of the aqueduct is essential to the completion of the reservoir, if it is to be anything more than a pretty enclosure, and that at the rate of progress which was then made, the work could not possibly be finished within the time limited by the contract, which fixed the date of completion as November 1, 1902.

The present proceeding, while directly intended to demonstrate that because of the defective character of the work and the inexcusable and unjustifiable delays therein, the contractors should not be paid the sum they now demand, is, in a sense, a criticism upon all the proceedings under the contract since the retirement of Chief Engineer Fteley and the transfer of Division Engineers Craven and Wegman from the reservoir to other works of which the Commission has charge.

A sharp line of demarkation is to be drawn between the work under Chief Engineer Fteley and Division Engineers Craven and Wegman on the one hand, and that permitted under Chief Engineer Hill and Division Engineer Ulrich upon the other.

The Merchants' Association recognizes that the present hearing is before a tribunal which it has charged with responsibility for the defective workmanship and for the delay of which the contractors have been guilty. Nevertheless, it is convinced that that tribunal will render a just and impartial

decision upon the evidence adduced. All its charges have been conclusively established.

THE CONTRACTORS ARE ASKING A FAVOR FROM  
THE CITY.

The contract explicitly provides that ten per cent. of the estimated amount of all work done and materials delivered and of their value may and *shall* be reserved and retained until the full completion of the contract, and in section U the contractors expressly agree "not to demand or be entitled to receive payment for the work or any portion of it, except in the manner set forth in the contract; nor unless each and every one of the promises, agreements, stipulations, terms and conditions therein contained to be performed, kept, observed and fulfilled on their part have been performed, kept, observed and fulfilled \* \* \* and until the engineer shall have given his certificate to that effect and the Aqueduct Commissioners shall have accepted the work."

Ex-Corporation Counsel Rives advised the Aqueduct Commission that, notwithstanding these explicit covenants, it had discretion to release the \$200,000 of the reserve fund if it considered the city adequately protected by the bond of \$400,000 (given by the contractors), and the residue of the reserve fund retained after the proposed payment. The estimated work performed up to October 31, 1903, is \$4,103,292.70, of which the contractors have received \$3,692,963.43. The ten per cent. reserve is \$410,329.27. If the present application should be granted, that reserve will be reduced almost one-half.

Despite the fact that charges reflecting severely upon the character of the workmanship and the delays at the reservoir had been in the Mayor's hands since the spring of 1902, the Aqueduct Commission last spring, after application by the con-

tractor for \$200,000 of the reserve fund, passed a resolution reciting that the Commissioners have made *a careful investigation* and are of the opinion that the city's interest will be adequately protected by the bond and the retention of the reduced amount of the reserve fund.

The Merchants' Association is not aware what careful investigation the Aqueduct Commission made. It knows only that it vainly endeavored for eighteen months to find a tribunal which would pass upon its charges of defective workmanship, violation of specifications and of delay, and that no such tribunal could be found until the Association filed with the Commission its emphatic protest against the proposed payment.

Whatever may be thought of the opinion of the city's law officer that the Commission may permit an encroachment upon this ten per cent. reserve fund before the work has been finally done and such completion signalized by the certificate of the engineer and the Commission's acceptance, we insist that in a contract of such transcendent importance to the city, all safeguards which the contract furnishes should be upheld. If the law allows an invasion of this sacred reserve fund, at the discretion of the Commission, it should first appear that the work has been properly done ; but if it should be established that such is not the case, the contractors should be strictly held to their agreement in Clause U, which inhibits them from asking any payment, unless each and all of the stipulations and conditions of the agreement on their part to be performed have been rigidly fulfilled. So far from this being the case we have conclusively proved that the conduct of this important work has been most scandalous in its disregard of essential requirements of the contract.

The letter of the Chairman of the Committee on Water Supply, Revision of City Accounts and Records of The Merchants' Association, dated July 17, 1903, protesting against this payment, and the

specifications of improper workmanship filed by counsel for the Association, define the particulars in which the contract has been violated. Although Mayor Low, in 1902, declined to assume any jurisdiction, he subsequently appointed Messrs. William H. Burr, John R. Freeman and Rudolph Her-  
 ing—who then constituted the Commission on Additional Water Supply—a special committee to examine and report upon the engineering features of this Association's charges against the Aqueduct Commission. Professor Burr, the Chairman of the Committee, was subsequently tendered the position of consulting engineer to the Aqueduct Commission at a salary of \$6,000 a year which he accepted. In our judgment he was disqualified from accepting the place and any reports which he has since made, approving work at Jerome Park Reservoir, are unworthy of consideration, because, before making them, he had become the paid advocate of the Commission. Special criticism of these reports will hereafter be made.

*Agreement of October 2, 1902.*

Chapter 588 of the Laws of 1902 empowered the Aqueduct Commission, with the approval of the Board of Estimate and Apportionment of the City of New York, to agree with any person, firm or corporation with whom the Commission had contracted or might thereafter contract, upon such terms and conditions as should in its judgment and discretion be for the best interests of the City of New York, that eight hours should constitute a day's work for all laborers employed by said person, firm or corporation in the performance of his or its contract, and that no laborer employed in the performance of any such contract should be required, permitted or allowed to work more than eight hours.

It is unnecessary to inquire into the source or motive of this legislation. Under this act, the

Commission, by an agreement dated October 2, 1902, extended the time of the contractors for the completion of the westerly reservoir until August 1, 1903, and of the easterly reservoir until August 1, 1904. The agreement seems not to have extended the time for the completion of the section of the Croton Aqueduct north of the reservoir known as "Croton Aqueduct North". Upon the theory that a ten hour day was twenty-five per cent longer than an eight hour day, twenty-five per cent was added to what was computed to be the labor cost of the unfinished portion of the contract and this amount (\$464,000), was equated into the prices of various materials, these prices, in some instances, being advanced as much as twenty-five per cent. over contract rates for all work then remaining to be done. The sole consideration for this extension and the enhanced prices, was the promise of the contractors to finish the westerly and the easterly sections of the reservoir, on August 1, 1903, and August 1, 1904; but this pledge has been already broken as to the westerly reservoir, and is sure to be so as to the easterly reservoir.

Although no excuse had been assigned for the failure to complete Croton Aqueduct North, and although the agreement in terms does not extend the time for its completion, and although the records of the Commission show that Chief Engineer Fteley in January, 1900, urged its early completion and notified the contractors promptly to finish it, the agreement increases the prices for the performance of all this work as well as prices for the performance of unfinished work upon the reservoir proper.

Mayor Low's vote for this agreement, according to the minutes of the Aqueduct Commission, was given "because he recognized that the policy outlined is desirable and in the interest of the city, and because he believed that it would shorten the time which will elapse before the completion of the



reservoir ; but as to the delays incident in the past he had no knowledge and expressed no opinion". Vain hope ! Despite the bonus of \$464,000 (since raised by changes in the work to \$600,000) which the city agreed to pay the contractors in excess of the contract price for completing the westerly reservoir by August 1, 1903, and the easterly reservoir by August 1, 1904, the *westerly* reservoir has not yet been finished, nor is there any prospect of its early completion. Within a few days the Commission has extended the time for its completion to October 31, 1904, and this extension has been given without satisfactory assurance that the reservoir will be ready at that date. The work upon the *easterly* reservoir is in such a backward state that years will elapse before it shall have been finished—the Acting Chief Engineer having recently stated to the Commission in a written report, that at the present rate of progress it cannot be completed before August, 1907.

If the foregoing recital is historically accurate (and it is), there would seem to be no reason why the contractor should receive any portion of the ten per cent. reserve fund. *This would be so, even though, in all of the work thus far done, the specifications had been complied with.* The audacious, unwarrantable and injurious departure from the specifications sanctioned by Chief Engineer Hill and Division Engineer Ulrich should preclude the possibility of this payment.

#### *Peculiar Character and Great Significance of the Contract and Specifications.*

That the specifications lie at the very basis of the contract and that no departure from their explicit terms could legally be sanctioned by the chief engineer, will appear from the following excerpts from the proposals, contract and specifications :

“Contractors will be required to complete

the entire work to the satisfaction of the Aqueduct Commissioners, *and in strict accordance with the specifications hereunto annexed. No deviation from the specifications will be allowed, unless the same has been previously authorized by, and written permission therefor obtained, from the Aqueduct Commissioners*" (p. 10).

"The parties of the second part (contractors) will, at their own cost and expense, *and in strict conformity to the hereinafter contained specifications*, furnish all the materials and labor necessary and proper for the purpose and, in a good substantial and workmanlike manner, construct the Jerome Park Reservoir, the adjacent aqueduct, the gate houses, roads, sewers, drains and other appurtenances, take down and reconstruct portions of the old Croton aqueduct, do all earth, rock and timber work, do all masonry work, furnish and lay all pipes, either iron or other pipes, and connect with the masonry or building therein all iron or other work ordered to be so connected or built, do all pumping and all other work necessary for taking care of the water that may interfere with the operations of construction, and do all the work necessary to construct the said reservoir, aqueduct and their appurtenances in complete working order, *in accordance with the plans and specifications*, in the manner and under the conditions therein specified" (Contract, A, p. 13).

"And it is further expressly agreed, that all the work, labor and materials to be done and furnished under this contract shall be done and furnished *strictly pursuant and in conformity to the following specifications* and the direction of the engineer as given from time to time during the progress of the work under the terms of this contract and specifications, *which said specifications form part of this agreement.*"

"The contractor is \* \* \* to perform and construct all the work covered by this agreement; *the whole to be done in conformity with the plans and these specifications*; and all parts to be done to the satisfaction of the said Aqueduct Commissioners" (Contract, page 17).

The failure of the engineer to demand increase of efficiency or improvement shall not relieve the contractor from his obligation to secure the quality of work and the rate of progress established in these specifications" (4, page 18).

"The plans and specifications are intended to be explanatory of each other, but should any discrepancy appear, or any misunderstanding arise, as to the import of anything contained in either, the explanation of the engineer shall be final and binding *on the Contractor*; and all directions and explanations required, alluded to or necessary to complete any of the provisions of these specifications and give them due effect, will be given by the engineer.

"Any unfaithful or imperfect work that may be discovered before the final acceptance of the work shall be corrected *immediately*, on the requirement of the engineer, notwithstanding that it may have been overlooked by the proper Inspector or estimated.

"The inspection of the work shall not relieve the contractor of any of his obligations to perform sound and reliable work as herein described. And all work of whatever kind which, during its progress and before it is finally accepted, may become damaged for any cause, shall be broken up or removed, so much of it as may be objectionable, and replaced by good and sound work, satisfactory to the engineer" (sub-div. 167, page 50).

The contractor agrees, in section L, so to "conduct said work that on or before November 1, 1902, the whole work covered by this contract and specifications shall be entirely completed" (page 54).

"In order to enable the said contractor to prosecute the work advantageously the engineer shall once a month on or about the last day of each month make an estimate in writing of the amount of work done and materials delivered to be used in the work and of the value thereof *according to the terms of this contract*" (T, page 64).

Clause U (page 65), has been already referred to.

Clause W (page 65) is as follows :

*“ And it is hereby expressly agreed and understood by and between the parties hereto that the said parties of the first part, their successors and assigns, shall not nor shall any department or officer of the City of New York be precluded or estopped by any return or certificate made or given by any engineer, inspector or other officer, agent or appointee of said Aqueduct Commission, or of said parties of the first part under or in pursuance of anything in this agreement contained, from at any time showing the true and correct amount and character of the work which shall have been done and materials which shall have been furnished by the said party of the second part or by any other person or persons under this agreement.”*

Perusal of these clauses impels the conviction that it was intended that the city's interests should be completely protected by the language of the contract.

In Section 30, Chapter 490, Laws of 1883, under which this contract was let by the Aqueduct Commission, it is provided

*“ that in no event shall the city of New York be held in any action or proceeding brought or had under any contract so made (by the Commission) to any other or greater liability than that expressed therein, nor required to pay out or otherwise dispose of any sum of money for the doing of such work or the furnishing of such material greater than is stipulated in such contract, nor otherwise than in strict conformity to the terms thereof.”*

Section 33 of said Act prescribes :

*“ All work hereby authorized to be done and all materials hereby authorized to be furnished, involving an expenditure of over one thousand dollars, shall be procured by contract in the manner required by and pursuant to the provisions of this act. The said Aqueduct Commissioners, however, may, without contract, cause such surveys to be made and such*



maps, plans and estimates to be prepared, as shall, in their opinion, be necessary to carry out the provisions of this act, and may appoint and fix the compensation of suitable engineers and other persons to supervise and inspect all work hereby authorized to be done. The said Aqueduct Commissioners may procure any work to be done, without contract, not involving an expenditure of over five thousand dollars, if they shall certify that in their opinion it is for the public interest that such work shall be so done; and in such certificate they shall state their reasons therefor."

*The Court of Appeals upon the Contract and Specifications.*

The views which the Court of Appeals entertains regarding the statute creating the Aqueduct Commission, and the contracts made by the Commission, are trenchantly expressed by Judge Peckham (now of the Supreme Court of the United States) in *O'Brien v. Mayor*, 139 N. Y., 545. The learned Justice quotes many provisions of the contract then under consideration, which was a contract for the construction of sections of the new aqueduct, the provisions quoted being identical, *mutatis mutandis*, with the provisions of the Jerome Park Reservoir contract.

Speaking of clauses B and 51 of the contract before the Court (clauses B and 166 of the Jerome Park Reservoir contract), Judge PECKHAM says :

"It appears from these citations that the decisions of the engineer are only made final and binding upon *the contractor*, and hence the defendants are not prevented from asserting the true construction of the contract under any of these clauses. The fact that the same expression is used in two widely separated clauses of the contract shows that neither the provision for binding the contractor by the decision of the engineer nor the omission to provide that the decision of the engineer should be final and binding upon the aqueduct com-



missioners or anyone in whose behalf they acted, was at all inadvertent. *Neither of these provisions authorizes the engineer to finally bind the commission by any decision he may make during the progress of the work.* The affirmative provision that the commission shall not be bound, places the matter beyond all question, and leaves it at liberty to contend for the true and legal construction of the contract, notwithstanding any so-called decision of a chief engineer to the contrary.

“This contract bears evidence of extreme care and caution in its preparation, and it was intended evidently to guard the interests of the city to the greatest extent possible consistently with the procurement of the work by responsible and capable contractors. In all large and public works, experience has shown the necessity for this endeavor. There is no spur like self-interest in business enterprises, and it may be regarded as certain that the contractor will always take care of his own interests so far as it is possible. This is natural and proper, and no fault can be or is found with such a fact. But how far the officers or employees who represent the general public or the corporation which is building the work can be depended upon for steady, earnest, zealous and able attention to the public interests is always a matter, to say the least, of some doubt. Hence the provisions for the binding force of the engineer’s decision upon the contractors and an omission of any such provision in relation to the other parties to the contract.”

Judge Peckham’s observations are remarkably pertinent. The Court plainly decided that there could be no deviation from the express language of the contract and specifications without previous authorization by and written permission of, the Aqueduct Commission. *That decision is the law of the present case.*

In regard to the contractors’ claims for extra work and for work outside of that provided for by the contract, the Court held that “extra work or work outside of the character or amount of that

specified in the contract, was provided for and a way pointed out which was to be followed in order to bind the defendant. *If work were done of this character without complying with those forms or without its being provided for in the contract, then no compensation for such work could be recovered. It seems to me that the statute contemplated a liability on the part of the city to be specifically set forth in a contract, and that beyond the terms and conditions of the contract, there should be no liability of the defendant for any work done or materials furnished in the course of the erection of this work.*

“It was to cover just such claims as are now under discussion that the sections of the statute were enacted. I think the result of their enactment was to so place the contractors with reference to the defendant that the character of its liability at any time was to be discovered by reference to the contracts themselves, and that no implied liability arising from the acts or omissions of any person should be suffered to be created in favor of contractors or the defendant compelled to answer in damages for any claims outside of the provisions and in accordance with the terms of the contract.”

The reasons for the decision are well stated :  
 “Obviously if a liability to contractors arising outside of and beyond the contract and in the course of its performance were to be created by the errors or omissions of any one of the small army of officials who were to be employed for this work, from the Aqueduct Commissioners and their chief engineer down through the various grades of service, the cost of the undertaking would be incalculable, and defendant's liabilities to the contractors for work done pursuant to the terms of the contract, would not be at all measured by the terms of the contract itself. \* \* \* Was it not the plain duty of the Legislature, while providing for the performance of and payment for a work of such large proportions, to also provide a check or bar to any further liability to the contractor for the work than should be found in the con-

tract itself? It seems to us plain that such was the duty of the Legislature, and after a perusal of the whole act, and particularly considering the thirtieth and thirty-third sections of the same, we think it equally plain that such duty was performed."

These quotations from the contract, from the act of the Legislature, and the decision of the highest tribunal of the State, upon a contract executed by the Aqueduct Commissioners, identical in terms, save that it related to the new aqueduct, emphasize our argument that the contract must be sacredly fulfilled, and that no power short of the Legislature can authorize any lack of strict observance of its clear provisions. Before any work not sanctioned by the contract is performed by the contractor, or performed in a manner different from the specifications, the written authority of the Commissioners to any change is imperatively necessary. Clause H (p. 52) expressly requires that for all extra work they shall certify that it is, in their opinion, for the public interest that the same be done, and state in their certificate their reasons therefor. The specifications must be rigidly adhered to, and "no deviation from the specifications will be allowed unless the same has been previously authorized by and written permission therefor obtained from the Aqueduct Commissioners."

THERE HAS BEEN NO LEGISLATIVE AMENDMENT, MODIFICATION OR REPEAL OF THE PROVISIONS OF THE ACT OF 1883, TO AUTHORIZE ANY DEVIATION FROM THE SPECIFICATIONS NOT EXPRESSLY PERMITTED IN WRITING BY THE COMMISSION ITSELF, OR TO JUSTIFY A RECOVERY ON THE PART OF THE CONTRACTORS WHERE THERE HAS BEEN ANY FAILURE STRICTLY TO OBSERVE ALL REQUIREMENTS.

The only legislation passed since the Act of 1883,

which affects contracts entered into by the Commission, is Chapter 588, Laws of 1902, already alluded to. That act does not excuse a deviation from the contract, *and it is important to note that the agreement of October 2, 1902, entered into, in pursuance of that Act, expressly continues all the obligations of the contractor strictly to observe the terms and conditions of the original contract.*

Paragraph A of said agreement provides that the city "will pay the prices hereinafter set forth (the increased prices) instead of the prices mentioned in the contract of August 23, 1895, for all work performed and completed and all materials furnished strictly in accordance with the terms of said contract of August 23, 1895, except as herein modified", from and after its date. The price of all work previously performed is by provision B left unaffected and clause E of the said contract is as follows: "That except, as herein specifically provided, the original contract is to continue in full force and effect."

The conclusion irresistibly follows that the requirements of the original contract and the specifications, all of which are expressly made part thereof, must be rigidly obeyed in every particular, except where a deviation is expressly authorized, by prior writing, by the Commissioners, and that no extra work not certified as necessary by the Commissioners in a certificate setting forth their reasons, shall be paid for.

Certain corollaries may be deduced from the language of the contract and the decision of the Court of Appeals.

1. That no part of the ten per cent. reserve can legally be paid over to the contractors until the work shall have been completed in conformity with the contract and specifications, and the chief engineer shall have given his certificate to such completion and the Aqueduct Commissioners shall have accepted the work.

2. That, as the contractors agreed not to demand any portion of the ten per cent. reserve until the time fixed by the contract for its payment shall have arrived, the Commissioners have no power to entertain the application, the opinion of the ex-Corporation Counsel to the contrary, notwithstanding.

3. That unless the specifications have been strictly complied with, the contractors are entitled to *no payment whatever* (clause U).

### *Gross Disregard of Specifications.*

The specifications have been flagrantly ignored by the chief engineer, Hill, the division engineer, Ulrich, and the contractors. Before analyzing the testimony, we ask the Commission to note, *in limine*, THAT MUCH LESS STRICT RULES AS TO THE PROOFS TO BE PRESENTED SHOULD BE REQUIRED IN A CASE LIKE THIS THAN IN A SUIT IN WHICH A CONTRACTOR WAS DEMANDING THE TEN PER CENT. FUND AS DUE. In such a suit it would be necessary for the city to establish the failure of the contractor to complete the contract in accordance with its terms. In this proceeding, it should be sufficient if the Merchants' Association has cast reasonable doubt upon the work. The Commission being the trustees of the city, charged with the sacred duty of superintending the execution of the contract, is bound by all rules of ethics and of public policy to keep the ten per cent. reserve fund intact, until it shall have certified to the full completion of the work, if there be any fair doubt that the contract has not been thus far faithfully performed in conformity with the specifications. Reasonable doubt that the contractors have done their duty, should prompt every official concerned, to vote against the contractors' request. We do not mean to imply that the testimony merely tends to discredit the work ; on the contrary, the



proofs amount to a demonstration that the contractors have been guilty of gross neglect and breach of contract, and that the Division Engineer and Chief Engineer entrusted by the Commission with the charge of this vast and most important public enterprise, have treacherously betrayed the city's interests.

*Purpose and great importance of Jerome Park Reservoir.*

There is no contract of the city government the early fulfilment of which is more essential to the city's welfare than the Jerome Park Reservoir contract. It was executed on August 23, 1895. Work proceeded with fair expedition until the Spring of 1900. Since that date practically nothing beyond excavation of earth and rock has been done upon the easterly reservoir and until within a few months nothing has been done upon Croton Aqueduct North. The only work which has progressed in the last three years (beyond some excavation) is the constructing of the retaining wall which has been substituted for the core wall and embankment in the westerly reservoir. Acting Chief Engineer Cook recently wrote the Commission that the easterly reservoir could not, at the present rate of progress, be finished before September, 1907, yet the contractors, who were voted a *bonus* because of their promise to complete it by August 1, 1904, are still drawing that *bonus*, although it is manifest that they will default.

*The reservoir is designed as a vital addition to the city's distributing system.* The maximum capacity of the old Croton Aqueduct is 80,000,000 gallons *per diem*. The new Croton Aqueduct takes a dip under ground about a mile north of Jerome Park Reservoir site, runs one hundred feet beneath the surface down to the Harlem River, near High Bridge, and there siphons under the river. The liability to clogging in the siphon is recognized by

all hydraulic engineers. Should the siphon need to be cleaned and the flow through the new aqueduct be stopped for that purpose, the city's only reliance would be the distributing reservoirs in Central Park. The present water consumption of Manhattan and the Bronx is 280,000,000 gallons a day. The Central Park reservoirs hold about 800,000,000 gallons.

In order to relieve New York from the danger of a water famine which would confront it in case of a stoppage in the siphon, or a break in the aqueduct, Jerome Park Reservoir was designed, to add to the distributing system within the city limits between 2,000,000,000 and 3,000,000,000 gallons of water. Gate-houses were also planned at the reservoir from which forty-eight inch mains should diverge to various sections of Manhattan and the Bronx, thus giving these boroughs a supply direct from the new aqueduct by means of the reservoir itself, in case some repair should become urgent, which should prevent a supply direct from the aqueduct, for a considerable time.

In any one of these several emergencies all that would stand between the city and a water famine would be the meagre supply of three or four days in Central Park. This is no fancy sketch, but unvarnished truth. The new aqueduct may at any time need repairs which will require the water to be cut off for several days. The situation which would then arise is appalling to contemplate. Yet by trifling with the work at Jerome Park Reservoir, we have been tempting Providence for several years.

*Ever since work upon the Jerome Park Reservoir began, the old aqueduct has been cut off.* The city's sole dependence, therefore, in case of trouble in the siphon, or of a break along the line, is the reservoir in Central Park which does not contain more than four or five days' supply. The urgent importance of early completion of the reservoir is apparent. The work, however, has languished for years, and the interests and welfare of the city have been perilously trifled with.

INEXCUSABLE DELAY IN WORK UPON CROTON AQUE-  
DUCT NORTH.

The time originally fixed for the completion of the contract was November 1, 1902. The agreement of October 2, 1902, extends the time to complete the westerly reservoir until August 1, 1903, and the easterly reservoir until August 1, 1904. It is singularly silent about Croton Aqueduct North, save for the expression in clause E that, except as modified, all the provisions of the contract of 1895 remain in force. Croton Aqueduct North ought to have been completed on November 1, 1902. The contractors' default renders them liable in damages to the city (clause M, page 54). This clause makes it the *duty* of the chief engineer, where the contract is not fully and entirely, *and in conformity to the provisions and conditions of this agreement*, performed within the time limited, or within such further time as may be allowed by the Aqueduct Commissioners for such performance and completion,

to "appraise the value of the direct and computable damages, caused to the city by such failure, owing to the disbursements made by the city on account of the further employments of engineers, inspectors and other employees, including all disbursements for office rent, transportation, supplies and other matters connected with the said employment; also the value of such other direct and computable damages as shall be caused by such failure." Clause M further requires that "the amount appraised, when approved by the Aqueduct Commissioners, shall be deducted by the parties of the first part out of such moneys as either may be due or may at any time thereafter become due to the contractor under and by virtue of this agreement or any part thereof";

and the decision of the chief engineer as to said appraisal, when approved by the Commissioners, is made final and binding on both parties to the agreement.

It may be argued by the contractors' counsel, that the time for the completion of Croton Aqueduct North has, in some occult way, been extended by the agreement of October, 1902. Aqueduct North does not lie within the westerly reservoir, the time for the completion of which as extended by the October, 1902 agreement, has already passed, nor within the easterly reservoir, which should be completed on August 1, 1904, although by the admission of the engineer (Cook) it will not be for two or three years thereafter. The agreement of October 2, 1902, expressly states, "that the original contract remains in full force and effect, except as herein specially provided". *Obviously, therefore, the contractors are in default as to Aqueduct North*, and the city has a counterclaim for damages under Clause M.

The importance of an early completion of all aqueduct work is recognized in the contract itself and is emphasized by the testimony upon this hearing.

Paragraph 175, page 51 of the contract, reads :

"The contractor shall in all cases regulate and arrange his work under the direction of the engineer (which by another clause of the contract means chief engineer), *especially in connection with the maintenance of the water supply through the old aqueduct.*"

At the northern terminus of Croton Aqueduct North the original plans and directions, which are also a part of the contract, provide for the erection of a gate house known as Gate House 1. By means of this gate house, water from the new aqueduct, which, at or near this point, descends one hundred feet under ground, is carried upon the reservoir level through Aqueduct North into the reservoir itself, *and this is the only means provided for filling the reservoir with water.* A completed reservoir would be useless until Gate House No. 1 and Croton Aqueduct North were also completed.



On May 22, 1899, Chief Engineer Fteley, in report No. 76, formally notified the Commissioners of the importance of progressing this work and the reasons for doing so. After calling attention to the intent of the plan he proceeds :

“ Considering the enormous increase in the consumption, which has more than doubled since the New Aqueduct was put in service in July, 1890, and the consequent difficulty of emptying the siphon under Harlem River in a sufficiently short time, in case it would become necessary to visit the Aqueduct at that point, *the time has come, in my opinion, when the aforesaid pipes, or a large proportion of them, must be laid.*

“ The Department of Water Supply, through its engineer, has already requested me to provide a connection for a 36-inch pipe which it is now going to lay, for supplying the district east of the Jerome Park Reservoir ; additional connections may also be asked for, possibly for a re-enforcement of the water supply of Brooklyn.

“ *The first step in the direction above indicated is an early construction of the section of the New Aqueduct included in the contract with Messrs. McDonald & Onderdonk ; I have already directed them to proceed without delay with the work, which is now well under way.*”

On January 18, 1900, he thus addressed his successor, Chief Engineer Hill :

“ In pursuance of a recent conversation, I send herewith a draft synopsis of the work to be done under the direction of the Aqueduct Commission (minutes of testimony, p. 322). \* \* \* The most of the work for Jerome Park Reservoir is now under contract, but on the reservoir proper it is not as much advanced as it should be. *It is especially desirable that the construction of the section of the Aqueduct included in the main contract be advanced for the purpose of preparing for the proposed independent lines of pipes to be laid directly to the city from the various gate houses built or to be built in connection with Jerome Park Reservoir. That work, a small part of which*



*was recently pressed to the attention of the Aqueduct Commission by the Commissioner of Water Supply, should now be begun without delay, in view of the ultimate deflection of the connection between the upper part of the Aqueduct and the city. The gap left in the old Aqueduct should be filled."*

The "section of the new Aqueduct included in the contract" refers to Aqueduct North, and also to that section of the new Aqueduct within the reservoir enclosure which forms a dividing line between the easterly and westerly reservoirs. The reasons for the completion of the section of aqueduct within the reservoir are as cogent as for the completion of Aqueduct North. Until the sections of the aqueduct shall have been perfectly completed, supply through the old aqueduct cannot be resumed; and the city, in case of the clogging of the siphon under the Harlem River or of a break along the extensive line of the new aqueduct, has no other dependence than the reservoirs in Central Park and the small reservoir at High Bridge. It cannot even have the benefit of the 80,000,000 gallons of water which might daily come through the old aqueduct. Until the sections of the aqueduct shall be fully completed, even though the two reservoirs be otherwise completed, Jerome Park Reservoir cannot be filled with water and the reservoir would remain useless.

Despite Mr. Fteley's letters and his clear and emphatic notification to Chief Engineer Hill, the delay upon Aqueduct North has been scandalous. *From the time of Division Chief Engineer Wegman's transfer in April, 1900, almost no work was done until after the John Doe proceeding was instituted by District Attorney Jerome.* This work was resumed in July or August, 1903. There is not the slightest excuse for this delay of more than three years. THE ONLY EXPLANATION WHICH APPEARS IN THE TESTIMONY IS GIVEN BY MR. RIDGWAY, WHO WAS AN ASSISTANT ENGINEER UNDER

MR. WEGMAN, THAT SOME TIME AFTER HIS AND WEGMAN'S RETIREMENT HE SPOKE TO THE CONTRACTORS' FOREMAN ABOUT THIS WORK, AND WAS INFORMED THAT NOTHING WOULD BE DONE UNTIL THE CONTRACTORS GOT RID OF AN INSPECTOR NAMED KENNY, WHO, IT SEEMS, WAS A STRICT AND DILIGENT INSPECTOR, AND WHOSE ONLY OFFENCE WAS THAT HE WAS RIGIDLY DOING HIS DUTY AS A CITY OFFICIAL (p. 490). This has not been denied.

The contractors argue that they could not obtain workmen, but this argument is readily refuted. Since the agreement of October 2, 1902, they have been stripped of this pretense, for no work whatever was done between October, 1902, and July or August, 1903. There is some sinister reason for the failure to proceed with this work. *Nothing will be done until some change of plan profitable to the contractors has been matured.*

Hill and Ulrich both admit that there was no excuse for the contractors' failure to progress this work. Ulrich testified as follows :

"Q. Did you ever request the contractor to proceed with that work (Aqueduct North) more promptly? A. Yes, sir.

"Q. When first? A. I *believe* in the summer of 1900, but it was a *verbal* request.

"Q. Prior to this year or the year 1902 did you put any of your requests either to the contractor or to the Assistant Engineer in writing? A. Not that I know of.

\* \* \* \* \*

"Q. When you first spoke to the contractor regarding the work on Croton Aqueduct North in the summer of 1900, as you say you did verbally—I presume you mean orally—what did you say to him? A. Well, that the work should go on. That the construction should go on to completion.

"Q. Yet to your knowledge between the spring or summer of 1900 and a few months ago, no work was done on that section of the reservoir work? A. Yes, no work was done.

"Q. Did you speak more than once to the contractor about progressing with that work? A. I do not really know.

\* \* \* \* \*

"Q. Did you ever write him a letter requesting him to proceed with that work? A. No, sir, but I believe the Chief Engineer did.  
\* \* \* \*

"Q. Now, will you tell me why when that work remained from the spring or summer of 1903, almost unchanged, you did not write to the contractor regarding it? A. Because I left that to the Chief Engineer's judgment.  
\* \* \* \*

I spoke to the Chief Engineer.

"Q. What did you say to him and when? A. Well, I said that the work could go on at any time and I think I spoke to him in the spring of 1902.

"Q. Did you believe the work could go on at any time? A. Yes.

"Q. And you have believed that all along, haven't you? A. Certainly have.

"Q. You have believed all along then that there was no excuse for the discontinuance of that work for three years, haven't you? A. I do (p. 1148).

"Q. And you are of that opinion now, are you not? A. Yes.

"Q. Then it is your opinion that there has been no legitimate excuse whatsoever for the discontinuance of the work on the Croton Aqueduct North from the spring of 1900 until this last summer? A. No, sir, except that in building the Aqueduct it meant that the city would be—had no use from the Aqueduct, and it would be an outlay of money there that the city would lose interest upon" (1148)

Upon cross examination, Mr. Hill was also asked:

"Q. Has work at Croton Aqueduct North in your opinion progressed as rapidly as it might have done? A. No, sir.

"Q. Is it not the fact that for about three years and a half practically no work was done there? A. Yes.  
\* \* \* \*

"Q. Have you ever written to the contractor to press that portion of the work? A. Yes.

"Q. When first? A. I think it was in the spring of—I am not sure—1902 or 1903" (p. 1550).

Witness was asked to produce the letter.  
The material part is as follows :

“ June 15, 1903.

“ MESSRS. McDONALD & ONDERDONK :

“ *Gentlemen.*—The work on the Aqueduct North of the Reservoir should be resumed at as early a day as possible. I have urged you in relation to this matter from time to time, *but as yet I know of nothing definite being done.*”

The excuse that the contractors could not get workmen before the Act of 1902 permitting the application of the eight hour law to this work, was not accepted even by the reservoir officials. They all knew better. Thus, Acting Chief Engineer in a report to the Aqueduct Commission on August 11, 1903 (see Min. of Commission for 1903, p. 450), states :

“ *The force along the Aqueduct section to the north could have been increased and should be.* The force of masons and laborers, also the plant now employed on the 300 feet of new aqueduct dividing wall at the northerly end should have been doubled and trebled, so as to enable the taking down of the old aqueduct from in front of the steam shovel. \* \* \* This section of 800 feet is where Mr. McDonald claimed he was not allowed to take down the old aqueduct and therefore could make no progress but the fact is this 800 foot section of new aqueduct should have been completed at least three years ago.”

The delay upon the Aqueduct North has been inexcusable. It is now proposed to fill the westerly reservoir from shaft 21 at the central gate-house (Gate-house No. 5). Even assuming that the water can be made to rise to flow line from shaft 21, it is evident that should any break or clog occur in the new aqueduct between the point a mile north of the reservoir, where it descends underground, and shaft 21, *it will not be possible to keep the reservoir filled*

*through that shaft.* Should a draft be made upon the water in the reservoir for city uses, because of a clog in the siphon under the Harlem River and the reservoir be depleted at the same time that a break or clog occurs between a point a mile north of the reservoir and shaft 21, the water will be drawn from the reservoir and there will be no possible means of refilling it. With Aqueduct North completed, there would be no trouble.

Waiving, however, all questions as to delay in the work prior to October, 1902, there is not the slightest excuse for delay since that time. The theory of the agreement of October 15, 1902, is that the contractor shall increase his force of men upon all parts of the work. That agreement augments the prices for work upon the Aqueduct North, as much as for work upon the reservoirs. The work upon the Aqueduct North was, as I have pointed out, to be completed by November, 1902, and the time for its completion has not been extended. But even assuming that it had been extended to August, 1904, the date fixed by the agreement of October, 1902, for the completion of the easterly reservoir, that reservoir will not be completed for several years. *Vide* report of this Commission of Engineer Cook, August 6, 1903.

The agreement of October, 1902, has put a premium upon the contractors' dilatoriness. It seems extraordinary that the contractors should have been rewarded by an advance in prices for work which they ought long ago to have finished. But assuming that what happened prior to the agreement of October, 1902, cannot now be criticised, how long is this important work to be delayed? What justification is there for paying the contractors higher prices, when they have violated the fundamental conditions upon which the higher prices were awarded, which were that they should finish the westerly reservoir by August 1, 1903, and the easterly reservoir by August 1, 1904? As trustees of the people of this city, what excuse can the



Commission give for recently increasing the time for the completion of the westerly reservoir and continuing the payment of the higher prices, when the contractors' promise to complete by specified dates, which was the sole consideration for the advanced prices, has not been performed?

*Leaks in the heavy wall, along the westerly side of the westerly reservoir.*

The heavy retaining wall, which has been built from station 17.50 southward along Sedgwick Avenue (the westerly reservoir), is a change of the original plan. The contract of August, 1895, the specifications, plans and drawings contemplated only a core wall and embankment construction around both reservoirs. The core wall and embankment construction is a standard form of construction, recognized as such by hydraulic engineers, and has been employed in practically all the storage reservoirs in the Croton River region.

*There is no provision, whatsoever, in the contract, or the plans or drawings upon which the work was let, for any retaining wall.* Clause 3, page 16, of specifications, says:

“Earth embankments, generally containing core walls, are to be built; the bottom and slopes are to be lined with an impervious covering composed mainly of concrete and brick and stone paving.”

The durability and stability of an embankment, especially with a heart or core of masonry such as is contemplated by the contract, and its impermeability by water, are beyond all question. This form of construction progressed until Mr. Fteley's retirement, *excepting at one place on the westerly reservoir between stations 10 and 17.50*. Here there rises a wall of solid impenetrable rock to an elevation higher than the flow line of the reservoir, and

Mr. Fteley and Mr. Craven, after consultation, decided that it was unnecessary to excavate in this solid mass for the insertion of a core wall, and therefore substituted a thin face wall or lining of the rock, of the dimensions of the core wall (testimony of Craven, pp. 156, 936). Both Fteley and Craven proposed to fortify this facing of rock with an embankment on the water side, should such a course be found desirable, so that the face wall would really be the core wall, located a few feet inside of where it was originally planned, the substitution being designed to avoid the unnecessary expense of excavating a solid hill of rock. Some core wall was built by Craven and Fteley at the southwesterly end of the western reservoir, and a large amount of core wall was constructed by them along the easterly reservoir, and also at Gatehouse 2, where, owing to the fact that the ground rapidly falls from reservoir grade towards Van Cortlandt Park and the river, the core wall construction was carried down to bed rock, a depth of more than seventy-five feet.

*Since the commencement of Mr. Hill's administration only 50 feet of core wall has been constructed* (p. 1151). Three sections of embankment have been built by him and Ulrich, every one of which has been constructed in utter disregard of the specifications. This last subject will be dealt with later.

The reason why Chief Engineer Hill discontinued core wall construction is patent, although, as we claim, it reflects no credit upon him. It indicates a disposition to benefit the contractors rather than to serve the city's interests. Embankment is paid for in earth excavation at the rate of  $23\frac{1}{2}$  cents per cubic yard. Rock excavation was to be paid for at 86 cents per cubic yard, and the building of rubble masonry cost the city \$4.86 per cubic yard. *The contractors profit by every additional cubic yard of rubble wall built*, as they get \$4.86 a cubic yard for it and are saved the expense of carting rock

away and of making embankment. Hence, the intrigues and manoeuvres, extending over several years, to substitute a rubble retaining wall, in place of the core wall and embankment, even in the easterly reservoir, where a great deal of core wall was built by Mr. Fteley and Mr. Craven.

Mr. Hill signalized his advent into office by writing the Commission as follows :

“ I beg to inform you that the excavation along the westerly side of Jerome Park Reservoir discloses the material to be very fine sand and clay. In my opinion, it would be unsafe to build a slope wall upon it. I respectfully ask authority to modify the plans by substituting a retaining wall instead of slope and core walls.”\*

In another communication he explains that this is to be a “ water-tight wall ” (Minutes of Aqueduct Commission, 1900, pp. 57, 59). This authority was granted, according to the minutes of the Commission, by an affirmative vote of Commissioners Ryan, Ten Eyck, Power and Windolph (*Id.*, 59).

These communications pre-suppose that the retaining wall is to be a “ water-tight wall ”. The authority to modify the plans requested by the Chief Engineer seems to have been only where the material was “ very fine sand and clay ” ; nevertheless, the retaining wall has been substituted as far south of station 17.50 as wall has yet been built, *whether the foundation was fine sand and clay, or solid rock*. Whether the authority to change would justify the building of the retaining wall on a solid rock foundation may justly be questioned. Gneiss rock may be fit for a core wall, imbedded in masonry, but its use in a retaining wall is criticised even by the biased Burr-Freeman-Herring report (p. 5).

Construction of the retaining wall commenced in the late Summer or early Fall of 1900. The face wall planned between Stations 10 and 17.50 by Messrs. Fteley and Craven, was not erected under their su-

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\*From the progress map at this time, the engineers could know little about the formation of the westerly boundary.

pervision, but was built after Division Engineer Ulrich superseded Mr. Wegman, in May, 1900. The only retaining wall which has been built in all this interval is between Station 17.50 and Station 49. South of Station 49 it is only partly constructed to Station 58, and beyond that point no wall has been built whatsoever in the westerly reservoir. There is no retaining wall in the easterly reservoir.

*Core Wall and Retaining Wall Totally Different Structures.*

This retaining wall is to be sharply differentiated from the core wall, which is six feet thick at its base and battered to a thickness at top of 2 1/2 feet. The retaining wall rests upon a foundation 16 1/2 feet thick, has a base 15 1/2 feet thick, is 30 feet high, and at its top is three feet thick. No embankment is intended to be placed *in front of* this wall, *i. e.*, on the water side. The contractors' motive for relieving themselves from the construction of further embankment is obvious, as they are paid for embankment in earth excavation, and the specifications are very stringent about the construction of embankments, as will hereafter be seen.

THIS VAUNTED RETAINING WALL, WHICH WAS TO BE "A WATER-TIGHT WALL", LEAKS EXCESSIVELY, AND IN THE JUDGMENT OF MANY WITNESSES, IS UNFIT FOR THE PURPOSE FOR WHICH IT WAS DESIGNED. ITS SUBSTITUTION IN THE WESTERLY RESERVOIR ALONE WILL COST THE CITY \$178,000 MORE THAN THE CORE WALL AND EMBANKMENT WOULD HAVE COST (Testimony of Alfred Craven, p. 935; not disputed).

Apart from such causes as defective inspection,

defective laying of the rubble stones, and imperfect bedding in mortar, the chief cause of the undue leakage of this wall is the inexcusable deviation from and violation of the specifications in the substitution of "rock dust" or crusher screenings, in the composition of mortar, in place of the "clean, sharp sand, free from loam" demanded by the specifications. There seems to be some doubt as to what parts of the face wall (between stations 10 and 17.50) was built with mortar made of rock dust, and discussion has arisen whether some portions of the retaining wall between stations 17.50 and 20.50 may not have been built with sand mortar. *But it is a fact worthy of note that rock dust was certainly substituted for sand in the mortar used in the wall south of 20.50; and that from about this point southward all the wall leaks excessively.* The startling coincidence between the stations where this leakage has been found to begin, and the stations where rock was first used in the mortar must be borne in mind. The leaks are so copious that even Professor Burr, the paid representative of the Aqueduct Commission, admits that "this portion of the wall appears to pass more water than it should." The substitution of rock dust or screenings for sand took place about October 19, 1900; and since that time screenings have exclusively been used. Sand such as called for by the specifications would have cost the contractors a dollar to a dollar and fifty cents per cubic yard (p. 175). The rock dust cost nothing. The contractors were in pocket by its use, because they would otherwise have had to transport it from the reservoir at an expense (p. 175). The gneiss and mica-schist rock which prevails all over the bottom and sides of the reservoir, when excavated, is blasted, broken into fragments of a size for transportation upon cars from the place of excavation to a spot selected on the site of the easterly reservoir, where an apparatus called a "rock breaker" was rigged up by or for the con-



tractors. The rock was here broken into sizes adapting it for use in the concrete masonry required by the contract. The refuse dust has for more than three years been used in place of sand.

With the exception of Engineer Elmer L. Cothell, who examined the retaining wall on November 20, 1903, spending only two or three hours in all in his examination (pp. 1425, 1427), of Professor William H. Burr, the paid servant of the Aqueduct Commission, and of Hill and Ulrich, whose own testimony and conduct discredits them, no one asserts that the wall is properly built. *The defense has not dared to call a single employee at the reservoir*, with Hill's and Ulrich's exception, to testify to the sufficiency of the retaining wall. All the men at the reservoir whom the Association has called, declare in unqualified terms that the wall leaks copiously, and has so leaked for twelve to eighteen months. The leaks are matter of common gossip at the reservoir. The employees ought to know, if any one can know ; they see the wall every day and have followed its construction from day to day.

The first criticism of this wall came from one of the Assistant Engineers, in the discharge of his duty. His reports bear the stamp of truthfulness. Even Professor Burr, who had a bias against this Assistant Engineer, has to admit that the reports, in respect to form, are those of a competent and reliable official (p. 1394) ; and Ulrich himself, after describing them as " exaggerated ", was forced to admit the same thing (p. 1215).

On January 16, 1902, Mr. H. C. Alden, the Assistant Engineer in charge of the westerly reservoir, reported to Division Engineer Ulrich as to the condition of the face and retaining walls on west side of reservoir. Under the heading " Leaks ", the report is as follows :

Sta.	13.00	1" x 1"	near reservoir grade.
	23.89	1 1/2" x 1 1/2"	at or near E. 108. Considerable water.
	24.13	1" x 1"	at or near E. 108. Considerable water.

Sta. 24.15	1" x 3"	at or near E. 108. Large leak with rapid and considerable flow of water. Hole was found plugged with pieces of cement, bags and wood.
24.27	1/2" x 1/2"	at or near E. 108. Considerable water.
24.41	1/2" x 1/2"	at or near E. 108. Considerable water.
24.47	1/4" x 1/4"	at or near E. 108. Considerable water.
24.79	1/2" x 1/2"	at or near E. 108. Considerable water.
24.93	1/2" x 1/2"	at or near E. 108. Considerable water.

Almost all of the wall between 22.75 and 26.30 is leaky at or near E. 108, and the above places are especially noticeable.

The report refers also to a number of cracks—some in the face wall, and a larger number in the wall between stations 29.53 and 37.50, and continues :

“ At no place is the coping of joints cracked, the notes refer to the cross joints. At places where the front and back of wall are both cracked, the injury, of course, goes clear through the mass, as where leaks were, as they extended all through the wall as when the water behind the wall was lowered by opening to the waste weir, the flow decreases.

“ Above examination was made on January 16, 1902, by Messrs. Alden, Crane, Sykes, Lyons and Garvin.”

Mr. Alden testified that this report was the result of a careful examination. The examination “ was made in the most careful manner ” (204) :

“ I don't remember exactly the time that it

consumed, but Mr. Crane and myself walked along the top of the wall, Mr. Sykes, if I remember correctly, walked along the front of the wall with Mr. Garvin, and Mr. Lyons was on the back of the wall, so we saw the top, the front and the back at the same time.

“Q. And you personally saw the various leaks and fissures which are described in this report? A. Yes, sir.

“Q. And you personally ascertained that they were of the dimensions given? A. Yes, sir.

“Q. And had the characteristics which are described in this report? A. Yes, sir” (p. 204).

Mr. Alden has repeatedly seen ice upon the wall. “I saw ice at just south of the side of the overflow structure and at irregular intervals down to gate-house 3, the side of it and between gate-house No. 3 and the southern extremity of the then existing wall, *a distance of 1,000 feet*; I saw patches of ice. They issued from the face of the wall—water did, and possibly formed patches eight or ten inches wide and two or three inches thick, extending right down from the point of leakage to the reservoir grade or to where the rock was at the foot of the wall. I saw icicles—I won’t use that term. *These were masses of ice*” (p. 206). Witness explains that the water and ice could not have come from water washing over the coping of the wall for “there was no water at that height”.

On April 27, 1903, Mr. Alden reported as follows to the Division Engineer :

#### REPORT CONCERNING BAD CONDITION OF WALL.

Assistant Engineer Alden to Division Engineer Ulrich.

April 27, 1903.

Mr. DANIEL ULRICH,  
Division Engineer.

*Dear Sir.*—It becomes my duty to further

inform you concerning the bad condition of the retaining wall and bank behind it near the overflow structure. The state of the wall itself has remained practically unchanged since the report concerning it dated and given to you on 22 December, 1902, except that a greater extent is now affected. It exhibits defects from Sta. 1840 ÷ to Sta. 2150 ÷ and from Sta. 2250 ÷ to Sta. 2310 ÷. These places are north and south respectively of said overflow structure. The northerly stretch is weeping both clear water and water tinged with yellows and on April 5th showed its leakage in places nearly up to the coping. It now extends to distances varying from five to fifteen feet below the top of the wall. The defective work south of said overflow structure shows clear water for the lower half of the wall.

The water used behind the wall for bank making was supplied during my visit of inspection on 23rd or 25th of April by one pipe 2' in diameter, running about half full and located north of the overflow structure, at a place where work is now being done.

The bank just south of the overflow structure and extending from 2190 ÷ to 2360 ÷ is also in very poor condition. Its top, which is about 8 feet below the crest of the wall, being badly fissured and exhibiting various depressions. On April 20th two holes revealed by inspection to be about one foot deep each had just been filled. These fissures, shrinkage away from the wall, and depressions, indicate a very serious internal disturbance of some kind.

If you wish a written report on that part of the wall from the Gate House 3 to near Perot Street, which showed defective on January 22, 1903, and following days, in addition to my verbal one, it will be placed at your disposal.

Respectfully,  
(signed) HERBERT C. ALDEN,  
Asst. Engineer.

On January 25, 1903, Alden orally reported to Ulrich regarding the condition of the wall on January 24, but as all his reports, written and oral had been ignored, he made no further report, until requested by the Division Engineer. On June 2,

1903, the Division Engineer wrote Alden instructing him to examine the wall and report upon its condition. Hence, on that day Mr. Alden, reported :

“ During the night of January 21, 1903, the pipe on Sedgwick avenue used to furnish water during the construction of gate-house 3 burst from the cold, and allowed the water to run behind the retaining wall over an area limited on the north by the bank just south of the gate-house and on the south by a dam near the rack of the wall at Perot street, a distance of 1000 feet more or less.

“ This flow continued until the morning of the 23rd when the water was turned off, the trench holding a volume of water two or three feet deep.

“ On the afternoon of the 24th January part of this water, as shown by the fallen surface ice, had disappeared and the *front of the wall within said limits exhibited numerous icicles or masses of frozen water, three or four feet above reservoir grade where teakage through the wall had occurred.*”

On July 17, 1903, Mr. Alden reported to the Division Engineer concerning leaks through test holes or trenches dug for the Burr-Freeman-Hering Commission. One of these trenches was located between stations 11.75 to 12.48 ; the second between stations 15.74 and 16.60 ; the third between stations 18.00 and 18.75. These were all located behind the face wall and the seepage was inconsiderable. The fourth trench was located between stations 20.45 and 21.30, behind a portion of the retaining wall as to which some question has arisen whether it was constructed with mortar made from sand or mortar made from rock dust. Here there is no serious amount of leakage, except that the report states :

“ 2079 jet of water at E. 126.8 is 3/8 inch diameter and spouts about one inch.

2074 jet of water at E. 126.5 is 1/4 inch diameter, spouts about one and a half inches.

2072 jet of water at E. 127.8 does not spout.”



ALDEN THEN REPORTED UPON EXAMINATION OF  
RETAINING WALL FROM STATION 23.50 TO 27.00.

This is the portion of the wall where assuredly crusher screenings or rock dust commenced to be substituted for sand in mortar. The report is based on an examination "made on 10 July, 1903, by Alden, Sykes, Lyons, Garvin", and is as follows:

"Water is behind wall from 24.67 to 26.05. North of this, bank is being made, and south of it there is an old bank.

From 23.60 to 24.67 bank is being made.

Elevation of water behind wall is 119.0.

*Condition of Wall.*

As a general thing the wall is more or less wet below E 117.0 from 23.60 to 26.20 and the whole of said stretch exhibits few or no dry patches, being almost entirely discolored by moisture.

From 26.20 to 27.00 wall shows discolored by moisture below E 107.0.

From 23.60 to 26.20 there are puddles at foot of wall, caused by the collection of water running down the face of the wall.

*Specific Leaks.*

23.50 E 108.6 Small leak.

23.72 E 110.0 " "

23.96 E 110.2 Leak 1/4" diameter, free flow of water down face of wall.

24.19 E 116.6 Hole 1/4" x 1/4" as near as can be estimated. Free flow of water down face of wall.

24.32 E 116.1 Two holes 1/4" diameter each, as near as can estimate. Water spouts 1" from face of wall. Free flow down wall.

24.37 Small leak.

24.55 E 115.8 Two small streams 1/4" diameter each, as near as can be estimated, spouting about 1' from face of wall.

24.56 .5 E 115.8 Leak about 1/8", spouting one inch from face of wall.

24.62 E 109.8 Small leak.

24.65 E 112.6 Small leak.

24.71 E 115.5 " " spouting 6" from wall.

- 24.78 E 110.8 Small leak—————  
 24.79 E 116.2 Leak  $\frac{3}{8}$ " diameter spouting  
 6" from face of wall.  
 24.84 E 115.7 Free flow of water down face.  
 24.99 E 114.0 Three streams each about  $\frac{1}{8}$ "  
 diameter issuing through split stone.  
 24.99 E 115.6 Small leak.  
 25.07 E 109.8 " "  
 25.15 E 111.9 " "  
 25.17 E 111.9 " "  
 25.23 E 113.5 " "  
 25.25 E 116.0 Leak about  $\frac{3}{8}$ " diameter,  
 free and considerable flow of water down face  
 of wall.  
 25.28 E 110.0 Small leak.  
 25.28 E 107.0 Leak  $\frac{1}{8}$ " diameter spouting  
 2" from wall.  
 25.31 E 104.4 Leak  $\frac{1}{8}$ " diameter spouting  
 1" from wall.  
 25.35 E 109.8 Small leak.  
 25.41 E 109.0 " "  
 25.46 E 107.4 " "  
 25.59 E 105.8 Leak about  $\frac{1}{4}$ " x  $\frac{3}{8}$ " spout-  
 ing clear of wall.  
 25.69 E 114.9 Small leak.  
 25.78 E 114.4 Leak about  $\frac{1}{4}$ " diameter,  
 spouting about 2" from face of wall.  
 25.86 E 109.3 Small leak.  
 26.02 E 105.7 " "

"I wish to state in conclusion, *that every leak and every indication of wetness was carefully checked by Mr. Sykes.*

"NOTE.—This report has been made up at as an early date as I could find time to do it."

In this section of the retaining wall (between stations 23.50 and 27.00 a distance of 350 feet), 37 leaks were detected by Mr. Alden and his assistants (p. 356). According to his recollection, that was the space in which the largest number of leaks were discovered. These were all carefully measured (pp. 356, 357). Several of them are leaks a quarter of an inch in diameter. *It is a striking coincidence that this is the identical portion of the wall in which Professor Burr found the largest number of leaks and*

*as to which he declared that "it passed more water than it should."*

On July 24, 1903, Alden made a report to the Division Engineer, covering the retaining wall between stations 33.40 and 39.67, which had been examined on July 21 by himself, Sykes, Lyons, Garvin (p. 332). This very lengthy report discloses a large number of leaks in a space of 627 feet. Several leaks one-quarter of an inch in diameter are noted. At most of the stations there was "free and considerable flow of water down face of wall". A large number of leaks an eighth inch in diameter are mentioned, some where the water was "spurting twelve inches from face of wall"; others "spouting six inches from face of wall", &c. (pp. 332-336, both inclusive). At many stations the expression is "wall wet to foot". This is explained by the Engineer:

"The expression 'wet' signifies that if the palm of the hand is placed against the wall at the places indicated, it will be immediately covered with water."

"All the foregoing stations, elevations and reports of leaks or wetness were carefully checked by Mr. Sykes, on the ground at the time" (p. 336).

The report continues: "In addition to the foregoing, *per* your verbal order of 22 July, *those leaks having a sufficient flow of water have been gauged* by ordinary means with the following results. On 22 July by Alden, Nye and MacCartney, and 23 July by Alden and Nye:

Elevation of water surface behind wall 116.2 on both occasions.

36.40 E 112.8. 47 Gallons per day of 24 hrs.

36.90 E 114.7. 558 do.

37.30 E 110.3. 43 do.

37.70 to 37.72 E 109.8. 47 Gallons per day of 24 hrs. Hole is at Sta. 37.71.

38.36 to 38.37 E 111.6. 36 Gallons per day of 24 hrs. Hole is at Sta. 38.36.

38.42 E 105.5. 68 Gallons per day of 24 hrs.

38.44 E 106.3. Water ran close along face and could not be concentrated.

38.49 to 38.51 E 109.4. 43 Gallons per day of 24 hrs. Hole is at 38.51.

38.62 E 113.2. Water ran close along face and could not be concentrated.

38.65 E 110.3. 18 Gallons per day of 24 hrs.

38.81 E 113.0. 54 do.

38.86 E 113.9. 72 do.

39.30 to 39.31 E 109.7. 68 Gallons per day of 24 hrs.

39.36 E 109.4. Water ran close along face and could not be concentrated."

At station 36.90 E 114.7, there were "two large leaks, one about 1/4 inch diameter and the other about 1/8 inch, 1 inch, making free flow of water down face of wall."

At this elevation the measurements of the escaping water showed a discharge of 558 gallons per day of 24 hours. *Between stations 36.40 and 39.36, or within a compass of 296 feet, by actual measurement, 1054 gallons of water escaped in 24 hours.* Even more water issued through the wall in this space, because some of it "ran close along the face and could not be concentrated."

Professor Burr estimated that a thousand gallons in a day of 24 hours escaped through the orifices which he found between stations 24.00 and 26.00 and he admits that more water flowed through this stretch of wall than a properly constructed wall should permit. We find 1054 gallons and more in a space of 296 feet between other stations. Surely this leakage deserves the same criticism as Professor Burr made upon the leakage between stations 24 and 26.

On August 14, 1903, Mr. Alden again reported to Division Engineer Ulrich concerning the famous portion of the retaining wall between stations 24.00 and 26.00—accurately, 24.47 to 26.15. This report is here inserted in full.

"KINGSBRIDGE, N. Y., Aug. 14, 1903.

Mr. DANIEL ULRICH,  
Divn. Engr.

*Dear Sir.*—I have the honor to report the fol-

lowing examination of the retaining wall from Sta. 24.47 to Sta. 26.15 made on 12 Aug. 1903. *The present condition of this wall was first noticed from the office windows* and a local investigation resulted as follows:

24.42 No water behind wall at present, has been up to Elevation 133.5. Wall dry but shows yellow stains from E. 122.3 to foot.

25.52 Wall nearly dry, but shows yellow stains from E. 122.3 to foot.

24.96

25.00 Water behind wall at E 133.0 and 2" (2 inches) deep. Face of wall wet and stained yellow from E. 125 to foot.

25.00 25.15 Face of wall wet and streaked with yellow from E 120.5 to foot.

25.26 No water behind wall, but filling is saturated. Free flow of water down face from E 116.0

25.28 No water behind wall, but filling is saturated. Wall stained yellow 12" wide, from E 117.0 to foot.

25.30 25.32 Elev. of water 131.5 & 6" deep. Face of wall wet and streaked with yellow from E 121.0 to foot.

25.42 25.44 Elev. of water 131.5 & 6" deep. Face of wall wet and streaked with yellow from 118.0 to foot.

25.45 25.48 Elev. of water 131.5 & 6" deep. Face of wall wet and streaked with yellow from E 122.3 to foot.

25.51 25.52 Elev. of water 131.5 & 6" deep. Face of wall wet and streaked with yellow from E 123.2 to foot.

25.64 Elev. of water 131.5 & 6" deep. Face of wall wet and streaked with yellow from E 121.5 to foot.

26.70 to 25.71 Elev. of water 131.0 & 2" deep. Face of wall wet and streaked with yellow from E 121.5 to foot.

25.78 26.06 Elev. of water 131.0 & 3" deep. Entire space wet and with broad yellow streaks from E 126.9 to foot, also.

26.87 E. 123.5 Free flow of water down face of wall.

26.98 E. 128.6 Free flow of water down face of wall.



From 25.76 to 26.06, water in trench at front face of wall contains brown sediment washed down face of wall.

26.15 Water surface 131.0 & is 3" deep. Wall wet and streaked with yellow from E. 123.8 to foot.

This *yellow* material on front face of wall, when wet, *can be easily brushed aside by the hand and is undoubtedly precipitated, after having been carried through the wall, from the bank material at its back.* No bank material included within the limits of the above stretch (24.47 to 26.15) has as yet been washed over the coping. Therefore the yellow sediment cannot proceed from this source.

Party—Alden, Sykes, Moore, Lyons, Garvin, Lowery."

On September 4, Alden again reported to the Division Engineer concerning the wall between stations 27.80 and 30.80. At station 30.18 E. 107.6, "large leak one-half by one-quarter, free flow of water down face of wall at 4 P. M.; at 10 A. M. this flow was considerably greater". The rest of the report shows that the wall was wet and stained brown at other places and that the floor of the reservoir was in certain places wet.

On October 13, Mr. Alden reported to Division Engineer Ulrich, regarding the condition of the retaining wall between stations 49.41 and 53.46. This report is as follows:

"KINGSBRIDGE, Oct. 12th, 1903.

Mr. DANIEL ULRICH,  
Division Engineer,

*Dear Sir.*—I have the honor to submit the following report on the condition of the retaining wall between Sta. 49.31 & Sta. 53.46, made on 10th Oct., 1903.

Party—Alden, Sykes, Lyons & Garvin. Time 11:30 A. M. to 12:30 P. M. Examination made after the violent storm of Oct. 7th to 9th, inclusive. Elevation of water behind wall 126.0, 49.31 to 49.35. Front of wall wet & slow dripping from E. 112.0 to foot of wall. Face of wall

between said limits covered with white efflorescence.

49.35 to 49.45 Same conditions as above from E. 107.0 to foot of wall.

49.45 to 49.47 E. 112.3 to foot same conditions as above.

49.49 to 49.50 Same elevations, same conditions.

49.57 to 49.58 E. 116.0 to foot of wall, wet.

49.64 " 49.85 E. 109.0 wall wet to foot. Also stained with brown and white efflorescence.

49.64 to 49.67 E. 125.4 wall wet to foot.

49.80 " 49.90 Wall wet and partly stained white from efflorescence from E. 107.5 to foot.

49.90 to 49.96 Same conditions from E. 110.3 to foot.

50.00 to 50.20 Wall wet between E. 121.0 & 110.0.

50.00 to 50.10 White efflorescence on face of wall from E. 107.0 to foot.

50.40 to 50.55 E. 111.0 to foot of wall wet & discolored white in patches.

50.83 to 51.03 E. 122.6 to foot of wall wet. And from E. 113.0 to foot of wall dirty white efflorescence.

50.94 to 50.94.5 E. 122.8 leak accompanied by free flow of water down face of wall.

51.01 " 51.04 E. 122.8 Wall wet to foot.

51.08 " 51.10 E. 124.5 to foot, wall wet.

51.22 " 51.26 E. 119.2 to 110.0 wall wet.

51.25 " 51.26 Wall wet from E. 110.6 to foot.

51.28 " 51.29 Same note. At both places wall covered with white efflorescence.

51.32 to 51.34 E. 115.3 to foot of wall. Wet and partly discolored white.

51.38 to 51.39 Same note as above.

51.45 " 51.50 Wall wet from E. 113.3 to foot.

51.55 " 51.60 Wall wet from E. 119.2 to foot.

51.55 At E. 119.0 dripping occurs.

51.67 to 51.86 Wall generally wet from E. 121.5 to foot.

51.98 to 52.00 E. 120.5 wall wet to E. 107.8.

52.17 " 52.22 Wall wet from E. 122.0 to E. 115.0.

52.23 to 52.28 Wall wet from E. 123.2 to foot.

52.23 Small leak at E. 122.5.

52.33 to 52.37 Wall wet from E. 124.0 to bottom. No water behind wall from here south. Bank wet.

52.47 to 52.57 E. 122.0 to foot, wall generally wet.

52.55 E. 122.3 small leak.

52.75 to 52.81 Wall wet from E. 115.5 to foot.

52.82 to 52.88 Wall wet from E. 122.0 to foot.

52.87 E. 122.0 small leak, Brown (iron) discoloration.

53.35 to 53.39 Wall wet from E. 116.8 to foot.

53.45 to 53.46 Wall wet from E. 111.0 to foot.

The white coating on the front of the wall has been previously noticed, but the examination has not been possible until the recent storm caused a pool to form behind it.

Respectfully,

(signed) HERBERT C. ALDEN."

These reports of the Assistant Engineer, whose examinations and measurements were made in conjunction with a party of assistants, bear on their face every evidence of verity. A subordinate would naturally not report to his superiors what did not in fact exist, especially when he knew, as did Alden, that by such reports he incurred their displeasure. These reports cover a period of more than 18 months. Their accuracy is vouched for not merely by the testimony of Alden, but also *by the testimony of Sykes*, who swears that he was present with Alden on these various occasions (389, 404, 405, 428).

Speaking of the condition of the wall in January, 1902. Sykes says :

"I have seen icicles hanging from it that extended out fully five or six inches from the face of the wall. \* \* \* There were very many. *It was a solid sheet for a long distance there. It could well be seen from the office windows* \* \* \* about 2,300 or 2,400 feet away. \* \* \* I was out there four or five times on those examinations"; April, 1903, summer of 1903 (390), January,

1902 (388, 389). "When Mr. Alden made these examinations, he called out every remark that he had to make in reference to those leaks, cracks or other defects in the wall. I put those notes in the book, and also made personal examination of each note that I did put in. I mean to say as it referred to the wall or the leaks" (391).

Sykes also declares that at other times than reported he has seen water come from the wall :

"In places I have walked under the streams, small streams, spurting from it. I remember one hole that was at least two feet deep. It was not an open hole but I mean to say that it extended into the wall at least two feet deep. There was a crevice in the face, an opening or crack, and there was water running off a piece of canvas that had been stuffed into this hole and, of course, when I was over there I looked at the thing and I pulled this piece of canvas out of the hole and picked up a barrel stave and pushed it into the hole about two feet without meeting any obstruction" (404, 405). Asked, upon cross examination, whether there were any leaks that he would describe as large or serious, he replied : "There were a number of leaks there from which the water has poured down the face of the wall, *so that you could hear the water plashing over the face of the wall*" (420).

These men are intelligent and trustworthy. Alden is an educated engineer with a native and disciplined intelligence that ranks him far ahead of Ulrich. Sykes also is an extremely competent man. There is nothing in the record or in the circumstances of the case to discredit them. They were doing their simple duty in constantly reporting the truth as to this wall, but Alden's reports fell upon deaf and unwilling ears.

*Alden and Sykes are corroborated by other employees.* Blauvelt, who is in charge of the office work at the reservoir, saw the wall wet during the winter of 1901-2 or 1902-3. "Know it was wet,

see the sun glisten on it in the morning" (610) Has seen the ice on the wall; looked at it with Ulrich. "We determined that it was ice". "I said (to Ulrich) *it made a pretty good looking Niagara*, and it did. Subsequently, I walked over to look at it and saw it was ice. *The water came through and had frozen on the face of the wall*" (611).

On another occasion he and Ulrich "*both took a transit and looked at it and saw it was ice*" (612). "I have seen water through the wall that would drop and run down the face in a thin sheet, enough to wet the face; if you ran your finger across it, it would make a break in it" (612), "I have seen some spoutings \* \* I saw a piece of stick with a canvas cement bag or something in it. The canvas was put in and shoved the stick in after it to hold the canvas in (613).

"Q. Have you ever heard any one speak to Division Engineer Ulrich about the leaking of that wall? A. *We all say it leaks. We have all said it leaks. \* \* I have heard others tell him it leaked*" (614).

Fleming, Superintendent of Dam Construction at the Reservoir, testified: "I saw them (leaks) between gate-house 2 and the weir or blow-off, and then from that down to gate-house 3, and I saw the leaks from that to Perot street to the end of the wall at that time. I never counted them, but there were several leaks, some large and some small \* \* streams coming out probably two or three inches from the wall, some under which you could walk" (566).

Fleming observed the wall: "It must be 18 months ago when we had a very heavy rainfall. It might have been in the fall of 1902. It showed up considerable with leaks" (467). Muddy color came through with the water "from behind the wall, through the wall." Fleming also saw icicles on the wall. "I did not get very close to them; I would not attempt to go because they might fall



down" (468). He also saw them from the office windows, half a mile from the wall (468). He testified: "There was a leak that had come out pretty well that was caused by a broken pipe, a water pipe that was supplying them with water at the masonry, and they had quite a leak. \* \* \* *This leaked pretty bad through the wall and then I suppose they got news of it or something, but they gave instructions to have it pointed up and it was pointed up after hours, after the men had quit working.* \* \* \* I found one hole, I think it was between the waste weir and gate-house 3. It went pretty well into the wall. *I put a stick in there probably 18 inches to 20 inches long. I put it in as far as I could with my fingers, and then had to draw it out. I could not reach anything in there with that stick, was not long enough*" (469).

Ulrich, himself, could not confute the statements in Alden's reports. He did not attempt to deny Blauvelt's assertion that the wall "looked like Niagara" but said merely that he did not "recollect" it (p. 1195). Upon receiving Alden's report of January 16, 1902, Ulrich sent it to Chief-Engineer Hill, with a letter as follows: "As to the leaks found between Stations 22.75 and 26.30, I would say that this was given a very severe test (?), as about December 3, 1901, the contractor suspended work on the masonry and disconnected a two-inch water pipe, this water was allowed to flow into the trench behind the wall where no filling or puddling was done, and the water so dammed that at least a head of five feet was formed behind the wall. \* \* \* Also this wall was built in the severe winter weather of December and January, 1902" (1040).

According to this remarkable letter, Division Engineer Ulrich considered a head of five feet as a "very severe test" of the wall. The leakage which Alden found occurred "at or near elevation 108", two or three feet above reservoir grade, where the wall was about fifteen feet thick. If this is a severe test what sort of a test is the wall

to receive when the reservoir contains 26 1-2 feet of water? That "no filling or puddling was done" (which is untrue) is immaterial, because a wall of that thickness should be impermeable, if properly constructed. The admission is noteworthy that "this wall was built in the severe winter weather of December and January, 1901, 1902." In his letter to Chief Engineer Hill of May 7, 1903 (p. 1049), Ulrich asserted that Alden's report of April 27, 1903, is "misleading", and in his testimony he declared it "exaggerated". Yet he was compelled to admit that on June 3, 1903 (but never until then) he directed the Assistant Engineer, who, according to him, made misleading and exaggerated reports, to "mark and locate any leaks showing on the face of the wall, keeping a record and reporting the same to me" (1055). How unsuccessful is his attempt to impugn the accuracy of Alden's report of January 16, 1902, and his subsequent reports, Ulrich's cross examination plainly shows:

"Q. When, after Mr. Alden's report (January 16, 1902) reached you, you examined this wall \* \* \* you found his statements to be correct? A. I did examine that, yes, and the statements were in part correct, except the cracks, and they were much smaller than this report.

"Q. *His statements as to the leaks, then, are correct, are they not?* A. *Yes, sir* (1199).

"Now, you agree that the wall at those stations leaked, as Mr. Alden stated in his report to you? A. *In regard to that report, I do.*"

Regarding Alden's report of June 2, 1903, concerning ice shown on the wall January 24, 1903, Ulrich, on cross-examination, said:

"I found icicles on the face of the wall, and at the time that I examined it it was very cold; it was a day or two after that, and it was about, I think, if I recollect right, about a temperature of 18 when I was there, and there was no water whatsoever; it had been frozen.

"Q. He (Alden) says, '*icicles or masses of frozen water*'. Did you see those? A. Yes, sir" (1208).

How valueless his criticisms of Alden's reports are, his cross examination discloses.

"Q. Did you observe that Mr. Alden ordinarily, in connection with those reports, called your attention to the fact that other assistants at the work were with him in making the examination? A. Yes, sir.

"Q. Now, Mr. Ulrich, do you think those men undertook to do their work faithfully and fairly, or not? A. I think that Mr. Alden, in many of his reports, exaggerated his reports" (1209).

"Q. You agreed with him, however, as to the leaks themselves? A. Leaks themselves; *I know the leaks were there*, but in regard to the size of the leaks I believe that many of those leaks, the size he mentioned, were not right, and it was smaller than that.

"Q. Did you ever examine the wall for the purpose of seeing whether those leaks were of the size he stated? A. *Not particularly* (1210).

"Q. Mr. Alden was very careful in his reports to give you not only the station number, but the elevation, as well as the size of the leak, so that any error on his part could be detected? A. He had orders to do that. \* \* \* *But he did not comply with the order in regard to the size (! !)*.

"Q. He called your attention to the specific place where a leak was, both by station number and by elevation above reservoir grade, and to the size of the leak, so that his examination could be tested, did he not? A. Yes, sir.

"Q. You say he exaggerated. Do you think he exaggerated because he failed to make careful examination? A. No, I think not because he failed; but I think he was inclined to exaggerate.

"Q. What motive had he to do anything else than report the truth as to that wall? A. Simply his motive for that was to condemn the wall itself. \* \* \*

Q. "Did you ever report to Mr. Alden that

his motive in making those reports was to condemn that wall? A. No, sir.

"Q. Did you ever take Mr. Alden himself to task for making incorrect reports or exaggerated reports? A. No, sir, because it did no good" (1211).

Ulrich's attention was then called to his written order to Alden of June 3rd, 1903, to continue his examinations and to report, and he was asked:

"Q. Do you want this Commission to understand that at the time you wrote him that letter requesting him to make reports you believed that he would make exaggerated and misleading reports? A. Not necessarily.

"Q. Is that the best answer you can make, 'not necessarily'—I wish to *know*. A. I think that all Mr. Alden's reports were exaggerated to a certain extent.

"Q. Why did you call upon him for a report when you believed he would make you an exaggerated report? A. Because he was the engineer in charge of that work and he was the one to make that report.

"Q. Why did you not, instead, either prefer charges against him, or take some steps to have him removed, or for the purpose of getting an accurate report, retain somebody else, if you believed he was making an exaggerated and misleading one? A. *That was not my affair at that time.*

"Q. What I want to know is whether when you wrote this letter to him of June 3, 1903, you in your heart believed the report would be unreliable? A. No, I did not in my heart believe it would be unreliable, but I believed he would exaggerate the extent of the wetness of the wall and the leaks, &c." (1213).

"Q. Then your whole course of procedure in regard to this wall has certainly been effected, had it not, by your belief, that Mr. Alden's reports were exaggerated or misleading? A. To a certain extent—yes" (1214).

"Q. On the face of the reports, dismissing the question as to whether they are correct or not, do not Mr. Alden's reports appear to be those of a very faithful, competent assistant, since he gives you the elevation and the station so that you can ascertain the precise point of



leakage in each case and size of the leaks by measurements? A. Yes, sir" (1215).

Alden had reported as to a leakage of at least 1,054 gallons in a day of 24 hours in 296 feet of retaining wall--between stations 36.40 and 39.36. Ulrich was asked whether he had examined this stretch, and he answered, yes (1216). He was then asked :

" Q. Did you see anything like a thousand gallons of water leakage in that place of 296 feet of wall? A. *There may have been.*

" Q. *Then his report is correct, is it not?*  
A. *It may be correct, yes, sir*" (1218).

No fair-minded person could have listened to Alden's frank and intelligent testimony and remain unconvinced of his ability and truthfulness. Mr. Alden has been upon the work ever since its initiation. He was assistant under Mr. Fteley and Mr. Craven, and, *at Mr. Hill's own instance, his salary was increased in the spring of 1900.* In the application to the Commissioners for the advance in salary, Hill described Alden as " faithful and attentive in the discharge of his duties and responsibilities " (Minutes of the Aqueduct Commissioners, Vol. 16, page 110).

The irresistible conclusion, from Alden's reports and testimony, which is fortified by the testimony of many other employees, is *that the retaining wall almost from the station where the use of sand in mortar was discontinued, leaked, and that the leaks extended along the heavy retaining wall as far as it had been constructed.*

It would be amusing, were the matter of less grave import, to follow the mental contortions of Mr. Ulrich upon his cross examination. Mr. Alden reported on September 4, 1903, as to the wall from stations 27.80 to 30.80 (300 feet), and as to a large leak one-half by one-quarter at elevation 107.6, &c. Ulrich says that the report was correct.



“ Q. I mean as to the precipitation, the leak, the size of the leak as he gives it to you ? A. I believe that report was correct.

After repeatedly asserting that he regarded Alden's reports as exaggerated as to the size of the leaks, he gave this testimony :

“ Q. Did you ever complain that he did not measure in an accurate way ? A. No, sir. *It made no difference to me in regard to the leaks, what the size of the leaks were.*

“ Q. *No matter how large the leaks were, made no difference to you.* A. *It did to a large extent.*

“ Q. *What do you mean ?* A. *What I was after was the location of those leaks.*

“ Q. *Why weren't you after the size of the leaks too ?* A. Because the size, if it was an inch square, would be stopped up just as well as if it was a quarter of an inch square, when we finished the wall ” (p. 122).

It is needless to point out how utterly irreconcilable all this is with his prior testimony, where he insists that Alden exaggerated the size of the leaks, or how ridiculous his answers are. They demonstrate his utter unfitness for the position of Division Engineer. Such a man should never have been appointed to such an important office. His retention in it is almost criminal.

The testimony of Mr. Alden and of various other employees at the reservoir as to the free leakage through the retaining wall and the ice formed upon it in consequence of leaks, is corroborated by that of Mr. Craven, former Division Engineer ; Mr. Edward P. North, ex-President of the American Society of Civil Engineers, and Mr. John Bogart, formerly State Surveyor of this State.

Mr. Craven's testimony relates to the wall, approximately between the blow-off (station 32) south-erly to gate-house No. 3, where water ran freely in places through the wall from the water used in puddling the fill, back of it (162). He saw no leakage between stations 10 and 17 (the face wall).

Mr. North visited the reservoir on May 20, 1903, and observed leaks in the wall through a stretch of 120 feet about gate-house No. 3 (519); also stains and discolorations indicating that the flow of water through the wall had been more copious previously (520). He did not deem the wall safe (559).

The leaks along the wall follow the work of puddling with a regularity which indicated cause and effect. The water used in puddling the fill behind the wall found its way through, and wherever puddling was stopped the leaking stopped (521).

Mr. Bogart testified to the same effect.

*Blauvelt suggested to Ulrich on several occasions that photographs be taken of the wall, but Ulrich was afraid to have such damning evidence of its condition (731). The only extant photographs were taken in July, 1903. Curiously enough, they relate only to the stretch of retaining wall between stations 33+ and 40.50. Upon cross examination Hill had to admit that the photographs revealed the fact that water had issued through the walls, showing in pools at the foot of its face (1488). The reflection of these pools was plainly discernible. No one examining the photographs, which are evidently the very best that the defence dares to produce, could fairly say that the wall looked like a proper construction.*

Ulrich in many places admits that the wall leaked; but both he and Hill maintain that when the wall is finally pointed up, the pointing may be relied upon to prevent leakage at these places. The testimony shows that the wall was not pointed upon the *back* before the fill was made, and it is plainly impossible to point after the fill has been completed. As to pointing the *face*, North and others testify that the joints of the face had been "plastered," which would not have been done had any further *pointing* been intended.

# REMARKABLE INTERVIEW BETWEEN HILL AND ALDEN.

Alden testified that when he was arraigned before Hill for his reports regarding this wall (he was treated almost like a criminal for doing his duty), Hill asked what should be done to make the wall impermeable. His answer was :

“That the wall could be repaired, and that the most obvious way of doing it would be to cut those joints out for a depth of six or eight inches, then fill them with a mixture of Portland cement and natural sand compactly rammed in, then strike the joints to give it a presentable appearance” (p. 378). That the Chief Engineer then asked him “*who should pay for that work*” (?) (379). Alden further testified : “*At the conclusion of my first interview the Chief Engineer remarked that, although it was not a matter of very great importance, still that I might, if I chose, modify or change my report in any way that I saw fit.*” “*I told him that I would stand by report as written*” (378).

Mr. Hill has not had the temerity to deny any of these statements. The suggestion of the Chief Engineer that a subordinate should change or modify his reports was most flagitious, yet not at all remarkable, considering the manner in which things have been managed at the reservoir. *The aim was to expunge these incriminating reports from the record.* All through Ulrich’s testimony it appears that he made what he calls “verbal” reports or “verbal” complaints. He was careful never to put anything on record. Written criticism of the contractors, written requests for modifications of work, &c., appear for the first time simultaneously with the John Doe inquiry instituted by Mr. Jerome.

Against this evidence plainly demonstrating the unfitness of the retaining wall practically the only testimony is that of Professor William H. Burr.

Neither of his colleagues (Mr. John R. Freeman and Mr. Rudolph Hering) gave testimony before the Aqueduct Commission. Hering, according to Burr's admission, visited the reservoir only *once* (p. 1512), and it is quite clear that Burr dominated his associates, drafted reports intended completely to exonerate the Commission and the contractors, and after a few emendations practically forced the assent of his colleagues (pp. 1389, 1390, 1511). Either Mr. Freeman and Mr. Hering have evaded testifying or the defence has been afraid to put them upon the stand.

### *The Burr Standard of Ethics.*

The unimpeachable facts are that Burr and his associates were instructed by Mayor Low, in February, 1903, to report to him (the Mayor) upon the criticisms which The Merchants' Association had made upon the Jerome Park Reservoir work; that they at once accepted the task, and that before any investigation was really begun—months before any report was made, Professor Burr accepted from the Aqueduct Commission, the position of consulting engineer at New Cornell Dam, at a salary of \$1,500 per quarter or \$6,000 per year.\* When cross-examined as to the propriety of such conduct, Professor Burr insisted that it was in conformity with his standard of ethics (p. 1500). No lawyer who valued his reputation, would put himself in a similarly equivocal position. No Court would hesitate to set aside the award of an arbitrator guilty of such improper conduct. Charged with the duty of making an impartial report to the *Mayor* upon the allegations of The Merchants' Association against the work done under the Aqueduct Commission at Jerome Park Reservoir, while in the midst of that task, before his work was more than initiated, Burr accepted the Aqueduct Commission's retainer. This disqualified him from making a fair report. On

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\* Burr says he got no salary, but (*sic*) at the end of three months I render a bill of \$1500, (1539½). He was, when he testified, *also acting as consulting engineer at Jerome Park Reservoir.*

July 27, 1903, a report was addressed to the *Aqueduct Commission*, signed by William H. Burr, John R. Freeman and Rudolph Hering. Symptoms of hesitation and unwillingness on the part of his associates to go to the extent to which Professor Burr was willing to go, are evident in the reports, and in the reluctance of his associates to testify. It is a circumstance of the greatest importance that the only portion of the wall which Professor Burr criticises is almost identically the stretch of wall where Mr. Alden had for 18 months been complaining of leakage. The Burr report says: "*Between stations 24 and 26, where the rate of leakage was materially higher than at any other point, one member of the Commission estimated the total leakage of this 200 feet at 1000 gallons per day of 24 hours. \* \* \* That portion of wall between stations 24 and 26 appears to pass more water than it should*". Cross-examined upon these statements, Professor Burr declined to say *how much more water* leaked through this stretch than should have passed through it, had it been properly constructed; but was finally forced to admit that his Commission had found leaks in that stretch which altogether amounted to fully 1,000 gallons per day (p. 1507). One leak alone, *the only one as to which the report gives any measurements*, was at station 25.60, elevation 106, where the escaping water was measured and "the rate found to be about 390 gallons per day of 24 hours." Three other leaks of similar character but smaller in amount were measured, and found to yield at about the rate of 46 to 60 gallons per day of 24 hours (p. 11). These, with the other observed, but unmeasured leaks, Burr admits, amount to 1,000 gallons in 24 hours, (p. 1507).

Professor Burr dismisses all Alden's reports with a majestic wave of his hand. Speaking of Alden's report of January 16, 1902, his report says:

"A list of leaks and cracks has been sub-



mitted to us as the result of a careful examination of the wall on January 16, 1902, between station 10 and station 3750, and *we* have carefully examined the wall between the same stations with that list in hand. Few only of the cracks and leaks recorded in that list are now to be found. \* \* \* From present appearances we are unable to give entire credence to the cracks having been of such large dimensions as stated in this list. We have as a matter of experience often noted the tendency to over-estimate the dimensions of cracks."

Between Alden, who has been steadily faithful to his duty, perhaps against his personal interests, and Professor Burr, who, while acting as an arbitrator, accepts a place from one of the contending parties, no honest and impartial jury would take long to decide.

Both Alden and Sykes swore to the correctness of Alden's reports, and to the carefulness of his measurements. The reports named the various other reservoir employees who united with them in the examinations. Professor Burr, as he admits, made no measurements (p. 1563, 4). His report shows none of the care taken by Alden, although it strikingly coincides with Alden's report between stations 24 and 26. The Burr report on leaks is throughout full of suppressions. It is a brief for the Commission, ingeniously drawn to omit what was unfavorable and to convey the impression that the core wall and the retaining wall leaked alike. The testimony of Assistant Engineer Baldwin and of Gerald McMurray and the written report made by Assistant Engineer Baldwin to Division Engineer Ulrich (p. 952, 578), *conclusively show that the core wall did not leak*. Furthermore, the core wall was a light wall designed to be buried in an impervious embankment, while the retaining wall was a heavy wall planned to come directly in contact with water in the reservoir and to be "a water-tight wall". Yet Professor Burr speaks of both classes of walls

as though they manifested similar leakage, which is absolutely untrue.

Burr's report shows that he felt that some defense of the retaining wall between stations 24 and 26 was necessary. It says: "It is possible, inasmuch as that portion of the masonry was laid in winter, that the weather was so cold *as to make water-tight work impracticable, or that the inspection was lax*" (foot of p. 12). The contract forbids the laying of masonry between the 15th of November and the 15th of April, except by permission of the Chief Engineer, and then contains rigid prescriptions for the course to be pursued should masonry be laid in that interval. These provisions of the contract were probably never complied with. Ulrich swears they were, but Burr was asked, upon cross-examination, to explain what amount of leakage through this stretch of wall would have been proper, to what extent the leakage was excessive, what he meant by the words "that it appeared to pass more water than it should", and why he sought to excuse its condition by asserting that the masonry was laid in winter when water-tight work was impracticable, or that the inspection was lax; but he failed utterly in his answer to such questions to reconcile his various statements. The leaks which he saw, in his judgment, did not exceed  $1/16$  of an inch in size. According to the testimony, an orifice  $1/8$  of an inch in size would pass a great deal more water, and an orifice a quarter of an inch in diameter would carry a much greater quantity, the ratio of increase being geometrical.

Alden carefully measured the orifices upon which he reports. No one else has made any measurements, with the exception of the one measurement alluded to in Burr's report (p. 11).

THE LACK OF ANY ARDENT DESIRE ACCURATELY TO TEST THE LEAKAGE OF THE RETAINING WALL IS SHOWN IN THE DEPTH OF THE TRENCHES WHICH THE BURR-FREEMAN-HERING COMMISSION DUG BEHIND THE WALL.

These varied in depth from three to five feet. In one or two places, where the fill behind the wall was incomplete, water was inserted, as well as in the trenches, but in no case was the depth of the water in excess of five feet. The reservoir when filled will contain 26 1/2 feet of water. Even Ulrich is forced to concede that a column of water of five feet depth would not press against the wall as would a column of water 26 1/2 feet deep (p. 1205). Many engineers and experts swore that such shallow trenches would not enable the Commission to make a fair test (495, 941, 1205). Burr's attention was called to this subject, upon cross-examination, and he was virtually forced to acknowledge that the trenches might well have been dug deeper (pp. 1525-1527). He took shelter under the plea that the fill behind the wall was "almost certain" in places to be permeated so that a thin column of water would descend almost to the bottom of the wall. If this happened, such a column would, *at that point*, correspond with the column which would be pressing against the face of the wall when the reservoir is filled. But he speculated upon the perfection with which the fill was made, and has to admit that in some cases (probably in many), the water did not find its way through the trench to the bottom of the wall. He had to admit that had trenches been excavated to the bottom of the wall, there would have been a far better opportunity to test the character of the embankment itself (1527). In effect, then, the famous Burr-Freeman-Hering examination was utterly inadequate.

*The Trench Dug in Ulrich's Bad Bank.*

As a work of supererogation, Burr and Freeman directed two trenches to be dug behind the Craven core wall (on the easterly reservoir). The core wall was not within the charges of The Merchants' Association. What Professor Burr wished to do was if possible to condemn the core wall built under the Fteley-Craven regime, as much as the retaining wall built under the Hill-Ulrich administration. *One of these two trenches, dug in a piece of embankment constructed under Craven, retained water, but the other trench, dug in a piece of embankment further south, built under Ulrich, would not hold water, for the embankment had been built in absolute defiance of the specifications.* Although well knowing that the southerly trench would not hold water, well knowing that it had been constructed by Ulrich, *and admitting upon his cross examination that it was obvious upon ocular inspection that the bank was altogether improper,* Burr suppressed, in his report, all mention of the fact that *two* trenches had been dug behind the core wall, that one of these trenches was dug in the Ulrich bank and that that bank had been so scandalously made as not to hold water. His report says: "Behind the core wall at about station 88, *a trench* about 100 feet long and three or four feet deep was excavated, a vertical interior face of the core wall of about ten feet height being there available for observation." He suppressed all reference to the trench dug near station 83 in Ulrich's embankment. Asked why he suppressed it, his answers are evasive. He pretends that his Commission were not ready to report upon the piece of bank which they *immediately* found to be wrong, although he admits they plainly saw it was improperly constructed. No candid person, reading his testimony, can fail to reach the conclusion that the suppression was intentional. The report was not designed to convict the contractors of any

defective workmanship under the Hill-Ulrich regime.

*Burr admits that his Commission did not test the wall between stations 36.40 and 39.36, where Alden almost contemporaneously reported that he found an escape of 1,054 gallons of water a day. This was a stretch of 296 feet; the leak was even greater than 1,054 gallons, for Alden found several leaks running so close to the face of the wall that it was impossible to measure the amount of flowing water, although it wet the wall to the foot, in each instance. If 1,000 gallons constituted excessive leakage between stations 24 and 26, was not 1,054 gallons excessive leakage in a stretch of 296 feet between stations 36.40 and 39.36?*

The retaining wall of the westerly reservoir when fully constructed, will extend over a distance of 6,700 feet. If, whenever there be a rain or an accumulation of two or three feet head of water behind the wall, every two or three hundred feet leaks a thousand gallons a day, this entire stretch of wall will have a total leakage in a day of 23,000 gallons or more than 8,000,000 gallons a year. *This leakage would be greatly increased, were the reservoir filled.* The idea of placing reliance for the impermeability and stability of the wall upon "pointing up" is absurd. The strength of the wall should lie in its mass, as a monolithic structure—and in the bedding of the stones in mortar (p. 366). The defense seems to fancy that there is something talismanic in pointing up the face. The back of the wall where the fill has already been completed cannot be pointed up, yet that wall leaks; and the plastering over the face referred to in Mr. North's testimony shows that they did not intend to do any further pointing. *If the water leaks through the mass of mortar in a wall 16 feet thick, how can the pointing of its exterior with similar mortar stop further leakage?*

The bank filling which is carried by the water



tends to close the pores in the wall and to render it impermeable, whereas when the reverse process takes place and clear water flows out of the reservoir, there will be no silt material carried. The volume of leakage would be greater for this reason as well as because of the far greater pressure from the water in the reservoir.

The evidence conclusively proves imperfect workmanship. The wall leaks badly. *If, however, the case were balanced, if there were doubt as to whether the wall was properly constructed, but nothing more, the reserved fund should be kept absolutely intact until the wall had been properly tested, and until all the pointing up has completely been done.* Even Burr's report says that pointing up will be necessary (p. 13). Why should the money be paid until this has been done? Is the city to have nothing to look to but contractors' promises?

In weighing the value of the testimony as to the retaining wall, three things must be kept in mind.

1. That the men who worked at the reservoir have steadfastly reported upon its condition since January, 1902, and have declared it to leak excessively.

2. That they are the only persons who ever examined the wall in the *winter* time. Corthell, Burr and his associates, have seen it only in the late spring or summer (1903), probably never after a heavy rain, and probably also at a time or times when Ulrich has done his best to make it look presentable. Alden, Sykes, Blauvelt, even Ulrich, say that there were "masses of ice" upon it in the winter. This ice was the congelation of the water which had come through the wall.

3. That the defense has not succeeded in finding an employee of the Commission, other than Hill and Ulrich, to assert that the wall is safe.

THE EXCESSIVE LEAKS IN THE RETAINING WALL WERE PROBABLY DUE TO THE SUBSTITUTION OF CRUSHER SCREENINGS OR ROCK DUST FOR SAND IN MORTAR. HOWEVER THAT MAY BE, THE SUBSTITUTION OF THE SCREENINGS OR DUST FOR SAND WAS A FLAGRANT AND UNJUSTIFIABLE DEVIATION FROM THE SPECIFICATIONS.

Hill, Ulrich and the contractors appear to have been a law unto themselves. Neither contracts, nor specifications have any significance for them. Whenever caprice, inclination or the interest of the contractors dictates, they ignore the contract and specifications altogether.

*It Paid the Contractors to Substitute Crusher Screenings for Sand.*

"Clean, sharp sand free from loam" as required by the specifications, would have cost the contractors about \$1.50 per cubic yard. It would also have cost to transport the rock dust from the reservoir site. They were, therefore, doubly benefited by Hill's direction, that the screenings be used in lieu of sand. McDonald had approached Craven on one occasion with the suggestion that sand be discarded, and screenings substituted, but Craven positively refused to entertain the suggestion (p. 171). McDonald waited until he had allies at the reservoir,—men who would do his bidding. *It is certainly remarkable that almost from the moment of Hill's and Ulrich's appointment, the contractors benefit and the city is put at a disadvantage.* Hill was appointed in January, 1900, at the instigation of Senators Hill and Murphy; he displaced Craven in March, and temporarily substituted Wegman. Wegman was dethroned in May, and the pliant Ulrich succeeded. From his accession dates a new era in the reservoir annals. Although Hill

knew, while Wegman and Craven were division engineers, what allowances they made to McDonald for broken stone, brick, and other classes of materials, Hill never dared to intimate to them that the allowances were too low (Hill's Cross-Exam., p. 1460); but as soon as Ulrich was installed, these prices were increased, in some instances more than one hundred per cent. In October, 1900, the crusher screenings were first substituted for sand. The substitution took place under most extraordinary circumstances, according to Ulrich's testimony. In August, 1899, McKeon, the cement tester, who was got rid of by Hill, had made a special test of cement with crusher screenings. He made five briquettes, consisting of a mixture of screenings and Portland cement in the proportions of two to one, and five briquettes in which these ingredients bore the ratio of three to one. These briquettes were found by Ulrich and his cement tester, Bettels, in the office in August, 1900, when they were broken, and appeared to disclose a tensile strength up to the normal requirements for sand mortar. Ulrich then directed Bettels to make ten briquettes of screenings and cement, in the proportions of *two to one*. These briquettes, he maintains, showed satisfactory results as to tensile strength. *Thereupon, without further tests, he and Hill made the revolutionary change of substituting screenings for sand, while Ulrich admits that a large number of tests should be made in order to determine the adequacy of such mortar* (pp. 1031, 1171-1173, 1176). When shown the inconsistency of his conduct and his testimony, Ulrich pleads that the tests were sufficient to justify the change, provided that "as the work progressed, you could go to work and make further investigations as we have done; \* \* \* provided subsequent tests indicated that the screenings were good" (p. 1177). Ulrich says that Hill directed him to make weekly tests, and report (p. 1020); then he states that Hill did not tell him to make weekly tests or report, at least

before April, 1901 (1178). He testified also that he had five briquettes made of *three to one* screenings on November 2, 1900; that besides there were "*sometests made between October, 1900, and April, 1901, but there was no record kept of them*" (1178).

"Q. *How many tests were made of which no record was kept?* A. *I don't know.*

"Q. *Why was no record kept of those tests?* A. *Well, there was no reason why there should not have been.* \* \* \*

"Q. *Why were they not put in a book. Why didn't you direct them to be kept in a book?* A. *I didn't consider it of enough importance.*

"Q. *Although you had undertaken to change the work so as to substitute rock dust for sand, and although you say the Chief Engineer instructed you to make tests, you did not consider these of sufficient importance to keep?* A. *He didn't instruct me to make those tests until after, in the spring of 1901*" (1179).

This contradicts his earlier testimony (p. 1020), and conflicts with Hill's. Hill, immediately upon learning of the October, 1900, tests, ordered the use of screenings, but "directed" Ulrich "to keep making tests from time to time, in order that we might know how the material ran" (1344).

*Ulrich furnished a garbled list of tests,—made up to suit himself, by selecting from the book of cement tests the records where the briquettes indicated a tensile strength approximating ordinary requirements, and ignoring all others. His list, upon cross-examination, garbled as it was, was shown to be incorrect, his additions erroneous, his averages greater than upon their face they should have been. It was conclusively shown that he had omitted a great number of tests which were totally unsatisfactory. According to the testimony of Bettels, all these tests were made of screenings taken from the mortar boxes and represented the very screenings that went into the composition of mortar* (pp. 1610, 1614, 1615).

In many cases the briquettes broke in the clips, or, after one day in air and six days in water showed a tensile strength of 30, 36, 40 pounds to the square inch, which is absurdly low. In other instances, the briquettes which showed fair results after seven days weakened and exhibited less tensile strength after thirty days. What the tests of which no record was kept would have revealed, can only be conjectured, but it is safe to affirm that, as no record was made, they were far below the standard. The testimony of Ulrich, of Bettels, and of Richardson proves that the personal equation has much to do with the making of the briquette, and the tensile strength it appears to exhibit (pp. 1012, 1621, 1654). It may be moulded under more or less pressure, or tamped, and tamping tends to develop higher tensile strength. Burr also makes similar admissions (p. 1546). Hence, any briquettes made under the Hill-Ulrich administration may well be looked at askance. Far from commending them, that should cast suspicion upon them.

Bettels was not a cement tester by profession, but was a laborer who evidently secured his appointment through influence, and not by means of a Civil Service examination (p. 1598). When Hill and Ulrich were installed, they removed McKeon (p. 1663) assigned Bettels to the duties of testing cement, sand, &c. Upon cross examination, Bettels testified :

*"Q. When you went to the mortar box to test screenings, did you get the crusher screenings out of the mortar box as they were being used?"*  
A. Yes.

*"Q. And took the material away into the laboratory?"* A. Yes.

*"Q. That was your uniform habit, was it not?"* A. Yes" (pp. 1614, 1615).

It would take at least seven days after this to determine whether the briquettes had the requisite tensile strength, or not, so that *at least seven days*



*would elapse after the screenings had gone into the mortar and into the wall, before the test would indicate whether the screenings had the requisite tensile strength or not.* Instead of making tests in advance, Ulrich's blundering method was to make tests of the screenings as they were used in the composition of mortar. Naturally, if defective tensile strength were disclosed, the defect was learned too late to be remedied. The whole business of testing screenings was ridiculous; it amounted to nothing; it was the merest sham.

THESE SALIENT FACTS APPEAR AT THE VERY OUT-SET OF THE CHANGE FROM SAND TO CRUSHER SCREENINGS:

That this radical change was ordered without adequate tests, that the tests made from time to time were made from mortar as it was going into the retaining wall; hence too late for remedy; that a full record of tests was never kept, and that the partial record discloses that in many instances the tests showed defective tensile strength.

The policy of the Hill-Ulrich administration was a policy of suppression. No records were kept. Nothing but the fidelity to the city's interest of a few subordinates has prevented the absolute destruction of all written criticism of any part of the work. Nobody would have known, and it was intended that no one should ever know, unless a catastrophe happened, and chemical examination resulted, that crusher screenings were substituted for sand, for there was not a vestige of a record upon the subject. And likewise we shall see hereafter that in every other instance of disregard of the specifications there was no record, and there is no means, outside of the oral testimony of a few faithful employees at the reservoir, of ascertaining that the specifications have been violated.

The Hill-Ulrich order to substitute screenings

for sand took effect October 19, 1900. Criticism of this edict from subordinates was abundant, but all recognized that true discipline required their acceptance of the commands of a superior. Finally, the screenings becoming so absolutely bad, that any decent subordinate was obliged to protest in self defense, Assistant Engineer Alden wrote Division Engineer Ulrich as follows :

REPORT CONCERNING BAD QUALITY OF STONE  
USED IN PLACE OF SAND.

April 26, 1902.

Mr. DANIEL ULRICH,  
Division Engineer.

*Dear Sir.*—Yesterday morning the broken stone used as sand was *especially bad*, and upon further investigation the same condition of things was found to prevail at the Aqueduct Division wall and at Gate House 5. It was, therefore, condemned according to your verbal orders of the 18th and 24th, to take such action when the material was found to be below the standard adopted by you sixteen months ago. To avoid, however, even any appearance of hardship to the contractor, the very best of said material was allowed for use in the mortar until a fresh supply of screenings could be brought upon the ground of the required fitness. Samples of this screenings were taken at the same time by Mr. Bettels, and are now in your office for inspection, and a messenger was sent requesting your presence in order that you could personally investigate *this very important matter*. Unfortunately, you had been called from the work, and this is the earliest opportunity to bring the subject before you. This material, as you well know, is the refuse or screenings from the rock breaker. It varies so in character that it is impossible to draw a line that will fairly distinguish *the better from the bad*, although at times it may seem to vary in fineness or color. *As it is not sand, as required under the terms of the specifications, its use as heretofore can only continue under your directions.*

Within the last day or so two of the Inspect-

ors have condemned carloads of these screenings on account of its extraordinarily bad appearance and character.

For the opinion of men observing it each hour of the day, I beg to refer you to Inspectors Condon, MacCartney and Babcock.

Respectfully yours,  
(Signed) HERBERT C. ALDEN.

This is assuredly a most extraordinary communication for a superior to receive from his subordinate. One would have thought Ulrich's cheeks would have tingled with shame upon perusing it. The samples which Alden sent to the Division Engineer's office for inspection were never analyzed (p. 1191); or, if they were, there is no record to show how bad the stuff was.

Alden puts the case most forcibly :

*"This material, as you well know, is the refuse or screenings from the rock breaker. It varies so in character that it is impossible to draw a line that will fairly distinguish the better from the bad. \* \* \* As it is not sand as required under the terms of the specifications, its use as heretofore can only continue under your directions."*

The Division Engineer was also informed that "inspectors had condemned carloads of the screenings because of their extraordinarily bad appearance and character" and in corroboration of his assertions, Alden referred to Inspectors Condon, MacCartney and Babcock. Not one of these men has been called by the defense against Mr. Alden.

This "refuse", this "rock dust"—substituted for sand simply because the substitution was wanted by the contractors to whom it was profitable—has been used in all the mortar made at the reservoir since October, 1900. The substitution is indefensible from every point of view, for the substituted material lacks the qualities of the "clean sharp sand free from loam" which the specifications explicitly require shall be used in all mortar.

The mortar at the reservoir was originally made from American or Portland cement and clean sharp sand in mixtures of different proportions according to the character of the work, the specifications providing for a mortar consisting of a mixture of one part in volume of cement to two parts of sand for certain kinds of work and for a mixture of one volume of cement to three of sand for rubble masonry. The rock crushed at the reservoir is gneiss rock, "seamy and stratified" (see Hill's letter to Aqueduct Commission for 1900, p. 57), which, according to uncontradicted testimony, and as is well known, consists of quartz, feldspar and mica. All the workmen at the reservoir who have used the crusher screenings as a substitute for sand condemn them as porous and slippery; asserting that it is impossible to get a bond between the cement and the screenings. The testimony of practical workmen like Alden, Sykes, Fleming, Craven, Ridgway, is worth far more than the opinions or hypotheses of men like Professor Burr, and Burr admits that mica is a dangerous ingredient. The record is replete with proof of the inadequacy of the screenings. This proof is of several kinds:

1. The screenings tested under Ulrich did not run uniformly, but exhibited defective tensile strength in numerous instances. Records were not kept in many instances.

2. Practically all the witnesses on both sides agree that mica is a constituent to be avoided in screenings. This opinion has not been put more emphatically than in the Burr-Freeman-Hering report of July 28, 1903, which says: "*The presence of mica in the fine screenings is prejudicial. In crushing rock for the fine screenings, micaceous matter should carefully be excluded*" (Report, p. 16).

*Brief Summary of Testimony Showing Noxious  
Effect of Mica in Screenings.*

Craven says :

"It is a by-product \* \* \* I don't know of any use that could be made of it \* \* \* It could be used to fill up a hole" (p. 171).

"Q. Well, you said that while you were divisional engineer you were approached by Mr. McDonald with the suggestion to employ this rock dust in lieu of sand in the composition mortar? A. Mr. McDonald did suggest to me one day that that dust might be used. I simply said *it could not be used*, and that was the end of it" (171). "I had always had the judgment that it was not fit to use and was not a substitute for sand" (173). "I am not a chemical expert, but gneiss rock is well known to consist of quartz, feldspar and mica; and when this is crushed and becomes very fine, the feldspar is readily acted on chemically by water and the salt and potash in it will soften and dissolve and leave the balance of it, which is aluminum or clay, and this varies; it varies considerably with all rock of a gneiss character. It varies in character until some of it runs into what they call mica schist; that is nearly all mica. The mica is an objectionable material to have, as is also this feldspar. \* \* \* Feldspar in gneiss is composed of potash and aluminum. \* \* \* When that is ground very fine, it becomes readily acted on by the atmosphere or water, and in that case the potash will be dissolved and carried away with the water in a solution and it leaves a residue of aluminum which is simply clay (173). \* \* \* *Mica, I believe every one will admit, isn't a very desirable material to make mortar of*" (174).

Craven described this kind of mortar as porous and defective.

"I don't believe it will make as good a wall as is required to hold water, and I think that it is very liable to deteriorate. *I think it is a very dangerous proposition to take a great piece of work and try experiments with it*" (174).



Craven further declared that the fine dust of the screenings would not mix well with cement.

“It forms a slushy kind of mortar that runs readily, and I believe that it runs away after the stone is set. I believe it settles away from the bed of the stone, and I think that is largely the cause of the leakage in that wall” (175).

Craven further declared that sand “costs all the way from fifty cents to a dollar and a half a yard” (175), and that if the contractor had to remove the rock dust it would cost him to transport it away (185).

Alden’s forcible condemnation of it in his report to Ulrich has already been quoted. He examined it in his hand and in a test tube, shaking it up with water on many occasions (211). He declared the presence of the mica detrimental :

“Nothing will take hold of mica, and it occupies the space that would be very profitably occupied by something more useful. \* \* \* Feldspar, when in a powder, is more or less decomposed, and is soluble under such conditions in water; it will wash away and leave a void” (212).

Rock dust is not a proper substitute for sand for hydraulic work (212).

“Ordinary sand has been used for hydraulic purposes and for other purposes as well, ever since we knew anything about masonry, and this rock dust is an experiment and should not be used for such an important purpose in my judgment until it is very fully tested; its use is now experimental; and further, the composition of the gneiss rock, according to the authorities, includes only from 66 to 75 per cent. of silica, and the remaining 33 or 25 per cent. (the feldspar and mica) is, in my judgment, a total loss” (212).

The mortar so made is more permeable (213).

Before writing his report of April 26, 1902, Alden had condemned the use of these screenings, and had told Ulrich they were "totally unfit for hydraulic use" (216). Ulrich directed the use and the continuance of use on different occasions (218).

Sykes, who acted as an assistant to Alden, occasionally taking the place of assistant engineer, testified that some tests had been made of the rock dust or screenings during Craven's time, and that "they were not up to the requirements or the standard of the natural sand and cement used there" (400). Sykes examined the rock dust twenty, thirty, forty times maybe, all over the west side of the reservoir; examined it in the mortar boxes day after day (400). He complained about it on many occasions, once told Ulrich: "I didn't think that was proper material to be used in place of sand" (401). "The superabundance of mica in the composition and lack of quartz, a considerable amount of dirt also \* \* \* hurt the mixture of mortar (401). The presence of mica is deleterious without doubt. Particles of the mica will wash out and leave the mortar porous \* \* \* it is too soft. There is not the body there would be to sand mortar." "I remember one time telling him (Ulrich) that I thought it a shame that a piece of work of such vast importance should be constructed in such a manner. I told him it was a pity that this work was going to the devil because of the use of this sort of stuff" (402). This remark was over a year ago in the summer of 1902, on a Saturday afternoon "we were going down in a car." "I think this use of this dust is the cause of the leakage of the wall. I believe that has all to do with it" (404). "I never failed to discover mica present in the rock" (450).

Fleming, Superintendent of Dam Construction, testified: "I saw mica in it. There was some in all of the various samples I have seen" (465).

Robert Ridgway, a civil engineer by profession, who was an assistant to Craven at the reservoir, and

who is now employed upon rapid transit work, testified: The rock broken at the reservoir "is gneiss rock containing a great deal of mica usually" (494). Ridgway never saw any at the reservoir site that did not. Mica is detrimental; "it prevents a bond in the mortar, that is, the cement will not adhere to the mica and it makes a weaker mortar" (494). He would not consider the use of rock dust instead of sand proper in making mortar for hydraulic work (495). It was also his opinion that the trenches built by the Burr-Freeman-Hering Commission were not sufficient to make a thorough test of the ability of the wall to withstand the pressure of water when the reservoir is full (495). In his day, Ridgway says, "we paid no attention to it" (the rock dust) (500). It might do to fill in streets; it was of no use whatever on the reservoir (501), nor would Ridgway admit, upon cross examination, that in some of the gneiss rock at the reservoir the proportion of mica present is small if not insignificant (504). He added: "*I have decided opinions on the use of rock dust. I do not think it should be used as mortar*" (505). Witness had heard of the use of "limestone" dust or screenings, but not of *gneiss* rock screenings (506). Both the mica and the feldspar are injurious (507). There is so much larger percentage of mica and feldspar in gneiss rock than in ordinary sand (508).

Mr. Edward P. North, ex-President of the American Society of Civil Engineers, declared mica very prejudicial in mortar (524). Engineers commonly recognize that it should be excluded from mortar. "I have seen it in more than one specification where mica is found in the country, that mica should be excluded" (p. 524). The mica "would reduce the cohesive strength of the mortar. It has an effect which anybody can see—the mortar has a greater fluidity, that is to say, mortar with the same amount of water in it having mica will form a flatter cone than mortar with the same amount of water with sand in it" (525). North

ascribed the excessive leakage of the retaining wall in part to the rock dust, another reason being carelessness in laying stone and not bonding them (526). He saw stone laid which were not raised again to see if a flush joint had been made, and *all* wet with mortar (527). He had paid a good deal of attention to the subject of mortar (542). "Cow Bay sand" is nearly a pure silica (544); there is plenty of good, sharp, clean sand on Manhattan Island (the witness specified several places) (545). "There is very little mica found in any sand in this neighborhood" (547). Witness had used crushed rock screenings of lime stone in different works but crushed screenings of gneiss are different (551). He found abundance of mica in the crushed screenings at the reservoir (552).

Counsel on cross-examination endeavored to make North say that crushed stone screenings fell within the definition of sand. His reply was: "I want to say that crushed stone screenings would not be sand under the ordinary acceptation of the term, and if you brought me Cow Bay sand and I said, 'Go away—bring me crusher tailings,' you would go into court and make me take the Cow Bay sand, and you would do it in a minute" (556). His impression was that the term crusher dust referred to either lime or granite dust. "They would not use gneiss in United States fortifications" (561).

Mr. John Bogart, also a member of the American Society of Civil Engineers and ex-State Engineer of the State of New York, visited the reservoir with Mr. North, when they obtained samples of crusher screenings from separate places (711). These samples were subsequently delivered to Dr. Endemann, a chemical expert, and by him examined (980). The reservoir rock "was a micaceous gneiss, I think the technical term is mica schist. \* \* \* It contains mica in thin layers and in such a way that the schist when broken into mod-

erately small pieces can be easily opened through the cleavage along the lines of the layers of mica" (713). Mortar made from such screenings would not be as good as mortar made with clean sharp sand (714). All the screenings he examined contained mica (719). Witness had never known of any crushed screenings being used other than crushed granite, crushed limestone, crushed sandstone, or crushed quartz in lieu of sand (728-9). In hydraulic work the mortar is of the utmost importance (729). Witness had never seen sandstone with mica in any such proportion as was contained in the samples of screenings he examined at the reservoir. "I have never examined sandstone with a view to determining how much mica there was in it, but I would not use it if there was a great deal of mica in it without washing it out."

#### *Screenings Chemically Examined.*

Two samples of screenings, one taken from a pile in use between Gate House No. 3 and the blow-off in the fall of 1901, another taken from a pile in use in October, 1903 (Fleming, pp. 968, 969), were identified and these, with the Bogart-North samples, were submitted to Dr. Herman Endemann, a well known chemist of this borough, a graduate of the University of Marburg in Germany, who has been an assistant of Professor Chandler at the School of Mines, Columbia University, and is repeatedly called as an expert in patent and other cases (980-1). Dr. Endemann subjected them first to a microscopical examination, and finally to a chemical examination (982). The microscopical examination was not needed to detect the mica, for the unassisted eye could see it. With the microscope it was found to a considerable extent, especially in the first three samples (982-3). Samples A, B and C contained the most mica and D (a sample obtained from the pile of screenings on October 26, 1903) contained the most feldspar. The



chemical examination revealed, in all the samples, the presence of free silica, or quartz ; also of mica, feldspar, hornblende or tremolite, chlorite, garnet, magnetite and calcite. The percentage of mica was difficult to determine. "Mica and hornblende or tremolite have practically the same composition. In fact, they have crystalized out in the original rock, and I think there is only one difference, mainly, a difference at which time they became solid and crystalized, and they are so intimately mixed that it is absolutely impossible to separate them mechanically, but they are chemically practically the same substances." *The percentage of silica in the various samples ran 29 in A, 28 in B, 32 in C, 30 in D. The noxious ingredients were 71 per cent. in A, 72 per cent. in B, 68 per cent. in C, 70 per cent. in D (984).*

Dr. Endemann had frequently examined building sands and cements and declared the presence of mica in the mortar to be deleterious. Not only the mica, but all the other noxious substances which he found in such large quantities, in these samples, "are acted upon by such alkaline substances as cements, as the ordinary cements" (987). The water in combination with the cement will act on these substances in disintegrating them. The effect is similar to what he had observed in an investigation of asbestos in cement. In the course of two years the asbestos had disappeared, had disintegrated. "This disintegration takes place with all the substances which I have mentioned (excepting quartz), with the exception, perhaps, of feldspar, of which I am not aware, which I have not tested in this respect, but which I have hardly a doubt will act practically the same" (987). This disintegration is the result of some chemical action, cement being decidedly alkaline.

On cross examination, Dr. Endemann stated more fully the method by which he had chemically ascertained the percentage of quartz and the deleterious ingredients in the samples (990). Asbestos

is simply a variety of tremolite or hornblende. The Doctor would not approve of mortar made either from crushed granite screenings or crushed lime stone screenings, because of the chemical action resulting from the union of the alkaline cement with the carbonate of lime in the crushed limestone (995). He had repeatedly examined ordinary building sands chemically (998). They generally contain about 95 per cent. of pure quartz (999). *There has been no testimony to controvert this and the contrast between ordinary sand, with 95 per cent. of free silica, and the crushed gneiss rock screenings with only 30 per cent of free silica is startling.*

Dr. Endemann, upon cross examination, reasserted his opinion that "mica is acted upon by cement"; "I have demonstrated it myself in my own laboratory". "I put cement upon it and observed whether the cement acted upon the surface. Mica is very lustrous, and I soon found that after the cement had been carefully removed by washing with water and a little soda, the imprint of the cement was left upon the piece of mica, and upon examining this imprint under the microscope, I saw that it was dented or corroded" (1000-1).

#### *Dilemma of the Defence.*

Against this mass of testimony as to the detrimental effect of mica upon mortar practically nothing has been adduced by the defence. The defence is in this dilemma, either to throw the declaration of the Burr-Freeman-Hering report overboard, regarding the injurious effect of mica, or to stand by it. It has attempted a straddle, but very unsuccessfully.

The Burr-Freeman-Hering report stoutly maintains that there is little if any mica in the samples of screenings examined by Mr. Black, an assistant whom Professor Burr sent from Columbia Univer-

sity to the reservoir to obtain samples for examination and test. Black selected a cubic foot of the screenings from the general pile. These screenings could not be "representative", although Burr declares them to have been, because the Burr-Freeman-Hering report admits that the rock bottom of the reservoir "is composed of gneiss *varying greatly in texture*" (Burr report, p. 5), and, secondly, because numerous witnesses for the Association assert that a cubic foot of the screenings found at one particular site, could not be representative of the rock which had been broken at the reservoir during the last three years (see pp. 451, 496, 504, 715).

Ulrich admits that the presence of mica is prejudicial. Of course he found little or none in the screenings. He was asked, upon cross-examination :

Do you consider that mica would be deleterious in those screenings? A. It would if it was in large quantities.

"Q. What percentage would you regard as injurious? A. Well, I should judge maybe four or five per cent.

\* \* \*

"Q. Won't you tell me what is the theory upon which you consider mica injurious? A. Well the *grains*! (this from a division engineer) of mica are very smooth and there is very little adhesion and, of course, that would weaken the mixture in regard to tensile strength" (1175-6).

Hill also admitted that mica was injurious, but declined to commit himself to any percentage or any theory respecting its effect.

Professor Burr also followed the same tack as Hill. Confronted with his report which said that micaceous material should be carefully excluded from the screenings, he had no alternative but to admit that such was the fact, but refused to fix any percentage.

The star witness for the defence upon this sub-

ject of mica was Mr. Clifford Richardson, an engineer of this city, whose testimony has been paraded before the public by the *Engineering News*, as demonstrating the propriety of the use of crushed gneiss rock screenings. Richardson examined the crusher screenings with the microscope and polariscope and found that the rock contained about ten per cent. of mica (1279). He was asked whether he found present in any of the mortar, samples of which had been examined by him, any quantity of mica sufficient to affect it deleteriously. His answer was, "not in my opinion". He compared the sample of crusher screenings he had examined with natural sand "*now available at the reservoir*" and guardedly testified: "If screenings which were *clean* and *of the same character as those submitted to me*, were used in a mortar concrete, the concrete would be equal to or superior to that made with sand available at the reservoir" (1285). It was shown that the screenings were not clean; that a few samples could not be representative, and that the sand "*now available at the reservoir*" is not the sand used by Craven and Fteley. The contract and specifications do not say that the sand which is to be used shall be obtained at the reservoir, but that it shall be "*clean sharp sand free from loam*".

So far, however, from justifying the substitution of screenings for sand Richardson's testimony is opposed to it. The utmost extent to which he would go was to say there is a "growing tendency to the use of crusher dust as a *constituent* of hydraulic mortar." "Q. To the *exclusion* of sand? A. *I could hardly state that to be the case* (p. 1297)."

This qualification is most important. Within a few years crushed rock limestone or slate screenings, *with sand added*, have been used in making mortar. Gneiss rock screenings are unknown, even with sand added. What Hill and Ulrich have done is to use crushed gneiss rock with its admittedly deleterious mica, to the total exclusion

of sand—and this change was made at the suggestion of McDonald's foreman Read (1008); whereas Craven had previously refused to sanction the use of screenings when McDonald had asked his permission (171).

Although Richardson had stated upon his direct examination that there was not *sufficient* mica in the screenings to be deleterious, on cross examination he was unwilling to state the percentage.

“ Q. You stated that in your judgment the amount of mica in these screenings was not sufficient to be deleterious. Do you recollect making that assertion? A. I do.

“ Q. That of course concedes scientifically that you might have a percentage which would be deleterious, does it not? A. I imagine so.

\* \* \* \* \*

“ Q. What I wish to know is whether you are willing to say that there is or is not a percentage of mica which would be deleterious? A. I am unwilling to say that there is or is not.

“ Q. So, if there were fifty per cent. of mica, for example, in this crushing, you are unwilling to say that that percentage would be deleterious? A. I should certainly be unwilling to say so without making a test.

“ Q. If there were 99 per cent. of mica in those screenings would you be equally unwilling to say that that percentage was noxious unless you were to make some personal test? A. I should certainly say so ” (1319).

This gentleman did not recognize that there was such a thing as a test of the crushing strength of mortar or of the crushing strength of rock (1320-22). He admitted that it was possible that M. Feret, a French authority upon mortar, might have condemned gneiss crushings on the ground that they have little strength and the briquettes readily disintegrate because “ many gneisses have that characteristic ” (1322). Why has not the gneiss at the reservoir this characteristic?

NOT A SINGLE WITNESS WITH ANY REPUTATION TO MAINTAIN HAS DARED TO ASSERT THAT HE HAS



USED OR KNOWN OF THE USE OF CRUSHED GNEISS ROCK SCREENINGS. I eliminate Ulrich from the list because he seems quite prepared to testify to anything, however absurd.

Hill pretended that in the construction of the reservoir at Syracuse while he was chief engineer in that city, crushed gneiss rock screenings had been used. On cross examination he was forced to recede from this position and admit that the rock with which the reservoir walls were constructed was Onondaga limestone; that there was no gneiss rock in the vicinity of Syracuse excepting a few boulders on the reservoir site (1452). It is remarkable that, having to crush the limestone rock for concrete, the engineer should have gone to the additional trouble of crushing occasional gneiss boulders. He was shown his own paper, read before the American Society of Civil Engineers upon the reservoir construction, which contained the statement that the concrete was composed "of one measure of American hydraulic cement, two measures of *sand* and three of stone," and was compelled to admit that there was no statement in the paper to the effect that gneiss rock crushings had been used in the place of sand (p. 1455). The fact was that he had used screenings of *limestone* rock *in conjunction with sand*, in mortar, and was forced so to acknowledge.

It is unnecessary to analyze in detail the testimony which the defence has introduced upon the subject of crusher screenings. It may be assumed for the sake of argument that of late years a tendency has arisen to employ crushed screenings of limestone such as were used at the Buffalo breakwater and by the Chicago, Milwaukee and St. Paul Railway Company, or of crushed limestone and crushed slate as in the celebrated Vyrnwy Dam, or in conjunction with sand, in the composition of mortar. Crushed quartz is the equivalent of sand, the only difference being that sand is the result of natural comminution, crushed quartz of

artificial pulverization. The only fair deduction from the testimony for the defense upon this point is that the crushings of rock rich in silica, as sandstone or slate, or of limestone, with or without sand added, have of recent years been used in mortar or concrete as a substitute for sand alone. It is true that Professor Burr in his report upon crushed screenings says that "fine crushed rock" is used "in place of sand for mortar", but every instance which he cites when analyzed amounts merely to this, that crushed limestone, sandstone or slate has been used with sand added. Upon his cross-examination he was repeatedly asked why he left out the important qualifying words "limestone", &c. The motive of his omission is obvious; he was the paid representative of the Aqueduct Commission, masquerading as a judge between the Commission and The Merchants' Association. Thus he states: "Fine *crusher screenings* have been successfully used *in the place of sand* during the past two or three years in the extensive break-water work for the harbor of Buffalo" (p. 14 of his report). This is untrue; the screenings used were "limestone"; they were not used *in place* of sand, but *with* sand (pp. 1531, 1533).

Upon cross-examination he was asked:

"Q. Do you know what kind of fine crusher screenings were used in the Buffalo break-water? A. I have forgotten that also, but as I recollect, it was limestone."

How remarkable the Professor's memory is! It seems he did not recollect this fact when he wrote his report.

"Q. Procured near Lockport along the line of the Erie Canal, is it not? A. I have forgotten that, it may be.

"Q. Mr. Emile Low is the engineer in charge of that work, is he not? A. He may be.

"Q. Any statement that he would make you would accept \* \* \* in regard to that work? A. I should accept——

"Q. Mr. Low, in a letter, states he did use crushed limestone screenings? A. He did.

"Q. Won't you tell me why in this very careful report you did not insert the word "limestone" between "crushed" and "screenings", so as to say not "crushed screenings" but "crushed limestone screenings" were used at Buffalo? A. Because it does not make any difference what kind of rock is used, as long as it is sound and durable (1533-4).

\* \* \* \* \*

"Q. You would distinguish mica as not sound and durable? A. Yes" (1534).

Asked to name one authority who had used crushed screenings of *gneiss* rock, Professor Burr could not do so (1532), but took shelter under the statement that so long as the rock was sound and durable the screenings would be proper, but he admits that mica is not a sound and durable rock.

The Burr report is utterly worthless because it does not attempt to distinguish screenings, the use of which had recently been sanctioned by eminent authorities, from those which are improper, nor does it state in what proportions the screenings were used or whether they were mixed with sand or not.

So, likewise, the various tests for tensile strength, made by experts for the defence, from a *few* samples of crushed rock obtained from the reservoir, are valueless, because a fair test cannot be made from a few samples alone; secondly, because all these so-called samples rest under suspicion; and, thirdly, because the method of moulding the briquettes and of estimating the tensile strength varies greatly. Briquettes may be lightly moulded or may be tamped, and the testing machine may be so operated as to show apparently higher results. THESE FEW TESTS HAVE NO VALUE WHEN COMPARED WITH THE MANY TESTS MADE AT THE RESERVOIR, WHICH REVEALED DEFECTIVE TENSILE STRENGTH IN THE SCREENINGS. THESE LAST WERE

TESTS OF THE SCREENINGS AS THEY WENT INTO THE  
ACTUAL MORTAR.

*The screenings used in the mortar often defective,  
according to the Reservoir Records.*

Attention has already been called to the fact that Ulrich adopted an *ex post facto* method of making and testing briquettes. Bettels swore that it was his uniform habit to go to the mortar boxes for the cement and the screenings he was about to test, and it needs no argument to show that his tests could not have been completed until long after the mortar was actually incorporated in the wall. If it showed defective tensile strength the error could not be remedied without taking the wall down.

Bettels testified: "*I go to wherever there is any masonry being done and wait until the sand and cement have been placed in a box and mixed, and then I take a large enough quantity to make a certain amount of briquettes, take it to the office, mix them with water and place it in moulds*" (1610). He repeated this upon his cross examination, when he said that he got the crusher screenings out of the mortar boxes as the screenings were used, took the material away into the laboratory, and that this was his *uniform* habit (1615).

Ulrich testified that Hill "instructed me to have tests made frequently of the screenings and cement, not only mixed in the laboratory or the office, but taken from the mortar box and tested, as it was mixed there" (1020).

AGAINST THE ADMITTED FACT THAT THE MORTAR WHICH ACTUALLY WENT INTO THE WALL, SHOWED MUCH LESS TENSILE STRENGTH THAN MORTAR MADE WITH ORDINARY SAND, ALL THE CAREFULLY PREPARED TESTS MADE BY BLACK AND RICHARDSON ARE UNAVAILING.

The screenings of which Alden complained in his

letter of April 26, 1902, went into the wall. The screenings tested by Bettels from samples taken from the mortar boxes in July, 1901, went into the mortar that went into the wall. Yet his tests of the samples he took on June 29, 1901, show that of the five briquettes, three broke in the clips, and were absolutely worthless, the remaining two indicating a tensile strength of thirty and forty-two pounds per square inch respectively for seven days. The tensile strength should have been at least eighty pounds per square inch (p. 1026-7). On August 16, 1901, briquettes made by Bettels showed an average tensile strength of only sixty-six 4/100 pounds to the square inch for seven days. Yet this sort of mortar went into the wall, week after week in 1901, 1902 and 1903.

The case against the crushed gneiss rock screenings could not be more conclusively proved. Summarizing the evidence, it is as follows :

1. Gneiss rock contains quartz, feldspar and mica, the gneiss at the reservoir "varies greatly in texture". No single sample would indicate the actual character of all the rock.

2. According to the Burr-Freeman-Hering report, micaceous material is detrimental *and should carefully be excluded from the screenings*. Feldspar also is injurious.

3. According to the testimony of the great bulk of the witnesses, the crushed gneiss rock at the reservoir contains a large percentage of mica. Richardson estimated ten per cent. in samples he examined, but Burr's visual organs found little or none.

4. According to Dr. Endemann who examined it microscopically and chemically, it contains at most 3½ per cent. of quartz, while ordinary sand contains fully 95 per cent. of quartz. The screenings contain mica, hornblende, feldspar and other similar substances—all injurious to the extent of the remaining sixty-seven per cent.



5. According to the men who have worked at the reservoir, the screenings are slippery, porous, too full of dust, and will not make a good mortar.

6. Bettels' own tests in many instances exhibit tensile strength far less than that of mortar made with sand, yet all this inferior mortar has actually gone into the wall. Bettels' records show the mortar grossly deficient in tensile strength, in 1901, 1902 and 1903. And Ulrich admits that no record was kept of many tests (1178, 1179). He acknowledges that the 1903 tests were all below standard but fails to excuse their insufficiency (1030).

7. The screenings were often debased by the admixture of dirt and other foreign material. The contractors in cleaning the tracks around the crusher, would throw the dirt into the cars with the screenings (Ulrich, 1191). Ulrich was asked whether this did not happen every day, and admitted this liability, as often as the car tracks were cleaned, which might occur once a month (1192). Bettels also showed that no precautions were taken to keep the screenings clean. Screenings dumped near the mortar boxes, in the fall, would be used during the winter or succeeding spring, although liable to befoulment by slush, rain, &c. (1606).

As to the deleterious character of mica, the witnesses on both sides are in accord, and while professor Burr's representative, Mr. Black, reports that the briquettes he made from a "cubic foot" of screenings said to be "fairly representative" (when it is abundantly shown that no cubic foot could be fairly representative), indicate a tensile strength greater than that of the sand at the reservoir, these tests are worth nothing (and the same is true of Richardson's) in view of the fact that Bettels' tests made week after week showed that the mortar made with screenings had tensile strength far below the standard of mortar made with sand,

and that this inferior mortar went right along into the wall.

It will be strenuously argued by the defense that the adequacy of the gneiss rock screenings, as a substitute for sand, has been demonstrated by Black's and Richardson's tests, and that a mortar made with screenings possesses a higher tensile strength than mortar with the sand now at the reservoir. All Black's briquettes were from a cubic foot of screenings procured in July, 1903; Richardson's briquettes are from three or four small samples obtained since that time.

The discrepancy in their results suggests either the unreliability of the screenings or of the tests themselves. The Black tests for a 3 to 1 mixture average for 7 days, 203; 127; for 28 days, 374; 238, taking the briquettes said to have been moulded under light pressure. The briquettes moulded by tamping made with Atlas Portland cement would indicate that the screenings are even better than Cow Bay sand, and these are the tests, so unfairly used by Burr, in his report. Richardson's tests, average as follows, 7 days, 220, 224, 224; 28 days, 440, 396, 446. The great disparity in these results tends to invalidate the tests or to establish a marvelous lack of uniformity in tensile strength. When Bettels' tests are taken into comparison, the differences are so startling as to arouse suspicion. Bettels' highest results for 7 and 30 days for a 3 to 1 mixture are 118, and 181.5. Bettel's tests on many occasions reveal a tensile strength so low as to discredit the screenings altogether, and Bettels tested the screenings from which mortar was actually made. The poorest of Bettels' results are tabulated as follows:

Tensile strength 3 to 1 mixture, screenings and Giant Portland cement, taken at mortar boxes (lbs., per sq. inch.).

Date.	7 days	30 days	60
1901 Apl. 3	broke in clips	40	
July 12	do	36	
1902 Apl. 15	do	38.8	
" 22	35.5	73.2	
1903 Mar. 30	70.		121.6
May 8	52.	50.8	
June 2	43.6	67.6	
June 8	73.6	114.	
" "	75.6	123.2	
" "	79.6	129.2	
July 8	58.4	93.2	
" 10	78.8	156.4	
" 10	75.6	106	
" "	79.	103.6	
Oct. 5	11.5	not given	
" 6	48.8	"	
" 7	65.6	"	
" 27	36.	"	

NOTE: Bettels' tests of screenings in comparison with the sand now at reservoir, usually give better results for the sand.

One test of screenings made in October, 1902, shows: 7 days, 122.4; 30 days, 156 and 6 months only 122.8.

Either Black, Richardson or Bettels has made some great mistake, or the samples of screenings were tampered with before the tests were made, or the screenings during the past three years have varied greatly in character, as all our witnesses declare. The few briquettes recently made and tested by Black and Richardson cannot obliterate the fundamental fact that screenings time and again showing deficient strength went into the masonry mortar. From such divergent results no one can fairly pronounce upon the superiority of screenings over sharp clean sand free from loam.

The doubt is fatal to the substitution. *The city is entitled to such sand as the contract and specifications call for, or it must be proved beyond reasonable question, by a practical unanimity of expert opinion and tests, that the screenings are superior.* When we take into consideration the proof that the screenings contain mica, which all engineers look upon with aversion, the further proof that no authority has sanctioned gneiss rock, and the evidence that the wall made with screenings mortar leaks copiously, the conclusion is fairly compelled that the use of the screenings was radically wrong. The real test of the wall will come when there is 26½ feet of water in front of it. Until that test has been made not a dollar of the reserved fund should be paid. Upon the fallacious assumption that the westerly reservoir would be completed this present winter, the Burr report suggests a somewhat similar test.

It is not important to devote much time to the testimony for the defence respecting the permeability of the mortar in even a well constructed wall. It may be conceded that a well built wall might be permeable to a small extent until it had been tested for some time by the actual presence of water in front of it; that particles of lime from the cement might appear in the shape of an efflorescence upon the wallface, and that the tendency of the efflorescence is to solidify the mortar. Thus, M. Feret, a French authority declares that the passage of water tends "to free small particles of the lime or cement and bring them to the surface where they produce efflorescence or fine stalactites according to the freshness of the mortar. These efflorescences tend to solidify the mortar and form an exterior coating." M. Feret gives tables which demonstrate "that when water is forced through a mass of mortar, stonework or concrete, or is allowed to go through, the *first hour* may show a considerable quantity of water going through, carrying lime particles which close the pores, and as the process is kept up, *each hour shows a diminished volume of percolation.*"

The tables show the lessening of permeability after a series of experiments beginning at one hour and covering a week, *at the end of which time there was practically no water coming through*" (see Vol. 29, No. 6, Proceedings American Society of Civil Engineers, August, 1903, p. 742).

We are not here dealing with such a condition, but with perceptible streams of water flowing through a wall, often big enough to carry bank material.

Whenever water has been placed behind the Jerome Park Reservoir wall, no tendency towards diminution of permeability has been detected; but if we may assume such an improbable thing as that the wall will become water-tight in the course of a reasonable time after the reservoir is filled, it becomes the plain duty of the Commissioners in view of all the testimony to withhold payment of any part of the reserved fund until this test can be made. In answer to the contention of the defense that the wall should not be condemned until water has been allowed to stand in front of it in the reservoir, we answer, "pursue this course—withhold payment, fill the reservoir, test the wall."

THE USE OF THE GNEISS ROCK SCREENINGS AS A SUBSTITUTE FOR SAND IS A DEVIATION FROM THE SPECIFICATIONS, AND CANNOT BE SANCTIONED, AS THE COMMISSIONERS NEVER AUTHORIZED THE CHANGE.

As the Court of Appeals has wisely said, the statute under which the Aqueduct Commission was created, and the contract in question are so framed as to prohibit the doing of work except "in strict conformity to the specifications."

The defense, realizing that the conduct of the engineers and contractor, in violating the specifications, was illegal, have endeavored to show that



crushed rock and sand, are the same thing and that both answer to dictionary definitions of sand. This effort has failed because :

1. The lexicographical test proves too much. It makes crushed limestone (carbonate of lime) sand, while there is no silica whatever in limestone.

2. Sand is a natural product. The word " sand " ordinarily means *natural sand*, and every witness in the case has unconsciously accepted the definition, for whenever he has employed the word, the context shows that he means sand and nothing else. Professor Burr admits that when the word sand is used, it means ordinarily the natural product, not crushed rock (p. 1515).

So Richardson says : " We use the term ' crusher screenings ' to differentiate from the natural sand " (1324); " sand always means a natural product " (1324, 1325). See also North (555, 556).

3. The use of crusher screenings in conjunction with sand has sprung up within a few years (pp. 1297, 1325). Its use is still limited, and there is no evidence that it was known in 1895, when the Jerome Park Reservoir contract was framed and let.

4. If crushed screenings are sand, what kind of screenings, would conform with the contract—limestone, sandstone, quartz, slate? Manifestly, gneiss rock screenings would not, because the constituents of the rock are injurious in mortar. The feldspar, as well as the mica, is bad (212, 985). Nor has any authority shown that crushed gneiss screenings are used to-day, much less that they were in 1895.

5. " Clean sharp sand, free from loam " means natural sand. The phrase " free from loam " proves this conclusively. Crushed rock could have no loam in it, and to use such words, had screenings been intended, would be a manifest absurdity.

6. The courts will not permit interpretation of a word which has an ordinary meaning. The word will

be assumed to have been used in its ordinary sense.

*Dickinson v. City of Poughkeepsie*, 75 N. Y.

*Collender v. Dinsmore*, 55 N. Y., 200.

*Brady v. Cassidy*, 104 N. Y., 147.

There is no force in the argument that because the words, "no deviation from the specifications will be allowed, unless the same has been previously authorized by, and written permission therefor, obtained from the Aqueduct Commissioners," are in the proposal blank, and not in the contract proper, they do not form part of the agreement.

An accepted proposal constitutes a contract, and the contract which is subsequently executed cannot differ from the proposals, where the law requires the advertising of proposals. Any other contract is unauthorized and void.

*Dickinson v. City of Poughkeepsie*, 75 N. Y., 65.

*In re Eager*, 46 N. Y., 100.

*Maxwell v. Stanislaus*, 53 Cal., 389.

The statute, Chapter 390, Laws 1883, requires the Commission to advertise for proposals.

See Section 26.

The proposals are part of and are included within the contract, as much as if within the language of the contract proper.

*Horgan v. Mayor*, 21 App. Div., 408.

*Dean v. Mayor*, 45 App. Div., 605, 606, 607, 616 ;

also 167 N. Y., 13, where the same doctrine is sustained, although the case was reversed upon another point. The specifications are also part of the contract, where it is so provided—as in the present case. Hence the contract governs, and the engineers and contractor were powerless to substitute

crushed screenings of any sort without the prior written authority of the Aqueduct Commission, which was never procured.

The act of 1883 forbids any recovery against the city upon any work not done in strict conformity to the specifications. This is a valuable safeguard to the city, and a necessary protection against improper work or any departure from the specifications. If the contract and specifications may be ignored in one particular, they might be disregarded in others, no matter how essential. To prevent this, to insure strict performance was the purpose and intent of the law and the contract. The Commission alone, by written authorization could direct any deviation from the specifications. Their responsibility was fixed.

*But even upon the violent assumption that the contract and specifications may be ignored, it is the imperative duty of the contractors and engineers to show that by the substitution of screenings, fully as good, if not better, mortar was obtained.*

This the proof has failed to show. On the contrary, the only just deduction from all the testimony is that the mortar is bad, and that the bad mortar is one cause of the leakage. From the place where the substitution of screenings occurs, the retaining wall leaks and the leak continues as far as the retaining wall has been built.

The change was not inspired by the desire of the engineers to benefit the city, but to favor the contractor. It had been refused by earlier engineers whose whole policy was to look out for the city's interests. An attempt to defend such a change is to be expected. But the change should not be approved in the absence of evidence amounting to a demonstration that it was beneficial to the city. The proof that it has been injurious is startlingly conclusive.

*You, gentlemen of the Commission, are trustees of the city, and you will be disloyal to your duty, if by your decision, you sanction a departure from the specifications, which you would not have approved in October, 1900,—even assuming that you have power to ratify changes already made.*

Had Hill and Ulrich, in October, 1900, told you of the few tests then made of screenings, and of the necessity for many tests as a basis for a safe conclusion, would you have authorized the change?

Had they brought you thereafter, not a garbled list, but the complete record, showing how many briquettes fell below the standard, would you have sanctioned the use of screenings?

Had numerous reputable engineers, whether engaged at the reservoir or not, assured you that mica is injurious in mortar, had chemists so assured you, and given you, as Dr. Endemann has, the percentages of deleterious matter; had Burr assured you that "mica is prejudicial"; had you been told that there was abundant mica in the rock (and you have seen it in samples produced before you); had the feldspar also been shown to be bad, would you have sanctioned the change? Without that prior sanction the change is illegal.

If you consider the substitution a benefit to the city, why do you not now place your approval upon record, and at least legalize for the future the illegal use of screenings that has been proceeding for over three years?

THE CHARGE THAT, IN BUILDING EMBANKMENT EAST OF GATE HOUSE 2 THE SPECIFICATIONS WERE FLAGRANTLY VIOLATED, WAS ABUNDANTLY PROVED, AND IS IN FACT ADMITTED BY BOTH HILL AND ULRICH.

East of gate house 2 the reservoir is bounded by

an embankment with a core wall inside. At this point along the periphery there was a ravine and the elevation of the land is less than in the reservoir bottom. The land falls rapidly away towards Van Cortlandt Park and the Hudson River.

All the witnesses agree that this is the most critical point along the reservoir boundary (Craven, p. 187; Alden, pp. 223, 228; Sykes, p. 397; Fleming, p. 461; Ulrich, p. 1246; Corthell, p. 1437). The core wall was planned to descend here to a great depth, and it was accordingly carried down to bed rock, at an elevation of 63.6—a distance of 42 feet below reservoir grade. The embankment is wider here than at other points along the reservoir periphery, and is built upon a slope of  $2\frac{1}{2}$  to 1 to insure greater stability (pp. 793, 222). The specifications should have been rigidly followed in the construction of embankment in six-inch layers, &c., nevertheless they were grossly disregarded.

The specifications provide as follows :

“The embankments for the reservoir and for the aqueducts shall start from a well prepared base, stepped, if so ordered, on sloping ground; *all embankments and all refilling shall be carried up in horizontal layers not exceeding six inches in thickness; every layer to be carefully rolled with a heavy grooved roller and to be well watered. The earth to be well rammed with heavy rammers at such points as cannot be reached by the roller. Special care shall be required in ramming the earth close to the masonry, which shall always be kept at least two feet higher than the adjoining embankment unless otherwise permitted*” (52).

“Ample means shall be provided for watering the embankments, and any portion of them to which a layer is being applied shall be so wet, when required, *that water will stand on the surface*” (53).

“*The earth used for refilling and embankments shall be free from perishable material of all kinds, and from stones larger than*



*three inches in diameter, and it shall be of a quality approved by the engineer"* (56).

Hill and Ulrich ignored these provisions and acted as though there were no such specifications to control the work. The testimony of Craven, Alden, Sykes, Fleming, McPherson, Blauvelt and McMurray, proves that the portion of the embankment running 150 to 200 feet east of gate-house 2 (the only section of this particular bank built under Ulrich) was not carried up in horizontal layers of six inches thickness, nor in any layers whatsoever, that the bank was not rolled or rammed; that it was not kept free from perishable material, and that stones a cubic yard in diameter, and even larger, were dumped from cars into the bank. The contractors for their convenience built a trestle on the outer side of the core wall over the ravine and laid upon the trestle a temporary railway over which they operated the cars which brought the material used in making the embankment. These cars were loaded upon the reservoir site with earth and blasted rock, and the contents of the cars were dumped into the bank irrespective of the size of the boulders which they contained. MacPherson, now in the employment of the Rapid Transit Commission, who was an inspector at Jerome Park Reservoir, between June, 1901, and January 22, 1902, and who was at one time detailed to take charge of bank making east of the gate-house, testified :

"In the first place they built a trestle-work across the ravine there, that is, north of the gate-house, on the embankment, and we filled that with cars from the steam shovels off the trestle" (768). The material in the cars contained a good deal of field boulders from 6 to 18 inches (677). I reported to the engineer (Ulrich) that the material was very unfit for the work. \* \* \* He came down and looked at it with others, and he said he would put out some of the large particles, and that we

should soon get through that rough part and get into better material again, \* \* \* to let it go into the embankment. \* \* \* When we passed through that ridge of rock we got into very good material again. \* \* \* Beyond that again we ran into another ledge of rock, just about the same material. \* \* \* When we struck the other ledge of rock I reported again that the material was very bad. At that time, that was on September 6, 1901, he told me to let it go as it is in bank; that was the answer he gave me (678). We got some rock there as large as a yard, a cubic yard."

*Ulrich does not deny the conversations.* MacPherson testified also that Chief Engineer Hill was present on one occasion, "about three weeks after we commenced to fill off the trestle" (679); that the trestle was in the bank and the bank was being constructed with the upright posts, &c., of the trestle in it; that Hill saw the boulders going into the embankment; "he made the remark that *he didn't like it*. That was all he said. \* \* \* He went up to the office but I heard nothing further. *I expected the work to be stopped.*" He testifies *it was not stopped, but continued in the same way* (681). MacPherson is deserving of full credence. He had no motive to state what was not true.

Realizing the impropriety of dumping these large boulders into the bank, MacPherson, of his own accord, used the utmost caution to prevent the boulders from coming in contact with the brick arch of a pipe chamber constructed from gate-house 2 towards the Sedgwick avenue sewer as a drain for the reservoir. He got the men "to use shovels and take all the fine stuff and pile it around so that any large pieces of rock would not strike against it or injure it in any way" (653). At a height of four or five feet over the arch, stone was again dumped (683).

Ingenious attempts were made by counsel for the defense to show that the boulders were deposited

outside of the limits of the embankment, but MacPherson proved that that was not so (pp. 697, 702).

Craven also described this point as "the lowest place in the reservoir. \* \* \* This was a point where in case of a break the most damage would occur. I will tell you why. Everywhere else around the reservoir, the natural surface is practically half as high as the embankment—as the water in the reservoir. In that case it is right down to the bottom, and the whole reservoir would drain through a gap there, while it would not in other places. \* \* \* We actually had to make a fill there to bring the reservoir bottom up to its finished grade. This does not occur anywhere else in the whole reservoir (188, 189).

Alden also witnessed the construction of this bank which is a section about 150 feet on the south or water side and 250 feet on the north or outer side of the core wall (394). He said :

"The fill should have been made with the greatest care and according to the specifications, in order that, if anything should by any possibility happen to that wall (the core wall), there would be a reserved safety to prevent outflow (371). The bank was 'neither placed in six inch layers, neither was it rammed, neither was it rolled' (372). Rocks were dumped into the bank. \* \* \* The rocks that I have seen varied in size from six inches on a side up to rocks nearly as large as the top of this table, say three or four feet, \* \* \* and possibly a foot or two thick."

There was no attempt at building the bank in six inch layers, nor was it rammed or rolled (pp. 224).

"That point is the natural outlet for that reservoir. It is the most critical point we have, and there the elevation of the ground is the lowest" (223).

Alden remonstrated against this construction several times, told Ulrich

“that unfit material was being used, and that it (the bank) was not being constructed according to the specifications” (p. 226).

Ulrich has not denied that Alden objected.

This piece of embankment was partially constructed while Ulrich was absent on a vacation and Alden was temporarily in charge for him (373). Alden allowed the work to go on only because the assistant in charge of the easterly reservoir was following Ulrich's directions (p. 374).

Sykes also saw the building of this embankment.

“They dumped the material out of cars \* \* \* rocks and sand. The rocks varied in size ; some of them very small and some half the size of this table, maybe larger. \* \* \* I won't bring it right down to a fine point that it was exactly the size of this table, *but they were large enough so that they had to pry off the side wall of the car or take that off to get a stone out of the car* (395).

Q. When you say you have seen very large stone dumped there, do you mean on one occasion or several occasions? A. Oh, *many* times, \* \* \* dumped into a place where the embankment was supposed to have been built according to the specifications” (395).

This occurred on the outer slope and the water slope as well (395).

It was obviously impossible, as the witness states, that a bank so constructed should be built in the six-inch layers required by the specifications, or rammed or rolled, and trestle was built into it (396). This is the most dangerous point along the reservoir perimeter, and in the witness' judgment there was no place where the bank should have been built so carefully (397).

Fleming, Superintendent of Dam Construction, condemned the bank in emphatic terms (460-464), and showed how differently embankment was constructed in Craven's day (459-60). He explained

how the trestle was built into the bank at this the "weakest point on the reservoir on account of the valley behind it" (461-2). The bank "was never rolled nor rammed, and carloads of large stones were dumped into it" (460-1). The rocks were so large that they had to be pried out of the cars; the door was not wide enough to let them out (465).

See also Ridgway, an educated engineer (491), who was at gate-house 2 on one occasion while bank making was in progress. Carloads of large stones were dumped there. The bank was not built in six-inch layers, nor was any portion of it rammed or rolled. Concerning the critical character of this point, he says:

"I understand that special study has been given to it because it appeared to be a most important part of the dam surrounding the reservoir. The surface of the ground there was lower than at any other portion of the reservoir, and it fell away very rapidly towards Van Cortlandt, so that at a distance of 1,200 or 1,300 feet it ran down to tide water level (492). \* \* \* The thickness of the embankment, taking both the outer and inner bank into consideration, was greater at that point than at other points along the reservoir (492). There is no point where it is more important that the bank should be constructed in exact conformity with the specifications than at that particular point" (493).

Gerald MacMurray, now an inspector of masonry for the Board of Education, formerly superintendent of Dam Construction at the reservoir, who had built a considerable portion of the core wall under Craven and was present when the Burr-Freeman-Hering tests were made and saw that the *core* wall did *not* leak, testified as to a conversation with Mr. Ulrich, which shows Ulrich's views regarding the specifications. He says:

"We were both conversing about that embankment at gate-house 2 and of course on the



occasions we talked about it had been going on different to how it was built here before, and he stated that he *didn't believe in a watered and rolled embankment*" (959).

The honesty and intelligence of this witness are beyond question. No one who heard his testimony can doubt that he spoke the truth. He also contrasts the Craven and the Ulrich method of building bank.

Neither Ulrich nor Hill claims that this portion of the bank was built in six-inch layers or rammed or rolled. Their excuse for not ramming or rolling is that the space between the bank slope and gate-house 2 was too narrow to permit the use of a roller (pp. 1247, 1352), but Ulrich acknowledges that it could have been rammed (1247). Many other witnesses say that it could have been rolled and there can be no doubt about the fact. The mode of making the fill in the ravine was utterly wrong and was adopted because it was easier for the contractors. No trestle should have been built or stone dumped, but the bank should have been started at the base, and carried up in layers six inches in thickness, so compacted as to be impermeable to water. Ulrich had to concede that this could have been done :

" Q. I suppose the contractor could have been compelled to bring material there in carts and shovel it up and ram it, if you had wanted to make him do it? A. Yes" (p. 1071).

Where it could not be rolled, the specifications required that it should be "rammed with heavy rammers" (Spec. 52). Ulrich admits it could have been so rammed (1061, 1247). He admits that "there was no bank built by him in horizontal layers where the layers were carefully rolled" (1239), and that it was the idea of these specifications that as each layer of embankment was deposited it should be rolled and watered and be in a condi-

tion to retain water on its surface, in fact be impervious to water (1239). He claims that there was a small portion of the work that was rolled, maybe "10 or 15 feet" (1248). He was specially asked as to the work done under MacPherson's superintendence, whether there "was any ramming or rolling done? A. No, sir; it was puddled". As to other portions of the bank where the specifications were violated, he inconsistently claims that the bank was built in six-inch layers. He says:

"The greater portion of that embankment (around the overflow) is built in layers from the fact that the material is shovelled from the place where it is dumped into puddles of water and that goes up into layers, one layer after another.

"Q. That is what you mean by layers, is it? A. Yes, sir.

"Q. That is to say, that as the material is shovelled in and is worked upon—operated upon by water—there is a rise in the level of the material? A. Yes, sir.

"Q. *And that is what you mean and all you mean by building in six-inch layers, is it?* A. Yes, sir" (1235).

Both Hill and Ulrich attempt to defend the trestle, but Ulrich simultaneously shows that he thought it wrong because he says he "believes" *he gave instructions to have the posts pulled* (1077). His autograph letter to Hill in regard to the trestle speaks for itself. The letter is dated July 11, 1903, after District Attorney Jerome had started an inquiry into the Jerome Park Reservoir work. Ulrich writes Acting Chief Engineer Cook that just north of Gate-house 2 and outside of the core wall it was *necessary* (not so) to build a temporary trestle which consisted "from memory of ten bents fifteen centres—with a sill eight inches by eight inches by eight feet to plumb posts made out of spruce trees cut on the reservoir, a cap about eight inches by eight inches by eight feet and two twelve-inch by twelve-inch stringers—the posts were

about twenty-four feet high and would average squared eight inches by eight inches with some cross braces. \* \* \* On October 16, 1901, the work was stopped and I went on my vacation the same day. I remember of (*sic*) telling Inspector MacPherson that the posts should be pulled. Assistant Engineer Alden was Acting Division Engineer in my absence of ten days. No report was ever made of the posts being pulled or left in." This remarkable Division Engineer never took the trouble to inquire, upon his return, whether his alleged instructions were obeyed. It is doubtful that he ever gave such instructions. He continues: "I do not know now whether the posts are in from my own knowledge, but I was told by Jean Cunningham, foreman for the contractors, that an attempt was made, but they could not do it (*sic*) as the posts were so firmly imbedded that they could not move them" (1084-5). Observe how he prefers the statements of the contractors' foreman to those of his own subordinates. Both he and Hill, and, it is true, Corthell as well, say that the posts would not injure the bank. This does not justify putting them there, because the spruce trees from which they were cut were perishable material and all stumps and trees had to be removed as bank was made and, secondly, because the specifications do not permit the presence of such material in the bank. Using a trestle was a mere convenience to the contractors, not at all necessary (Ulrich, p. 1071). Professor Burr does not attempt to defend leaving the posts in the bank, but disapproves of it, although he suppressed all reference to it in his report (1522.) Corthell had to admit that he would not draw specifications providing that such material might remain (1439).

The overwhelming and practically uncontradicted testimony is, that this, the most critical portion of the reservoir enclosure, was built in utter disregard of the specifications, that enormous boulders were dumped into it, and the mandate that it

should be built in six-inch layers, carefully rolled and watered, and that where it could not be rolled it should be rammed with heavy rammers, disobeyed. The contractor had every motive to disregard their specifications, and his pliant instruments, Hill and Ulrich, never remonstrated, but permitted him to make the embankment by dumping earth and rock from cars and watering the dumped material with a hose. No engineer would presume for a moment to defend this as a "puddled" embankment, but the specifications do not speak of "puddling"; on the contrary, they are explicit as to the method of construction. There cannot be a particle of doubt that the specifications were flagrantly violated in respect of this work. Nor is this embankment safe. It is appalling to contemplate what might happen if this weak bank gave way. Van Cortlandt Park and the village below it would be overwhelmed.

THE EMBANKMENT BACK OF THE RETAINING WALL ALONG SEDGWICK AVENUE FOR A DISTANCE OF ABOUT 1900 FEET WAS ALSO BUILT IN DEFIANCE OF THE SPECIFICATIONS. IT WAS NOT CARRIED UP IN SIX-INCH LAYERS WELL WATERED, NOR RAMMED NOR ROLLED.

It is unnecessary to multiply citations from the testimony in support of the above proposition. The testimony is abundant. Neither Hill nor Ulrich pretends that the specifications were followed. Hill says that he gave instructions to puddle the bank, and that it was puddled.

*Puddling does not conform to the specifications.* But even this puddling was not properly done as the Burr-Freeman-Hering report very mildly declares. There was also unnecessary excavation

back of the face and retaining wall as will hereafter be shown. Speaking of this unnecessary excavation, the Burr-Freeman-Hering report says (p. 13) :

*" That a space is left between the rock face and the back of the wall, which should be filled and puddled with the best quality of puddle material and with the greatest care. This does not appear to have always been the case. We recommend that this puddled back filling be done with such good quality of material and abundance of water as to attain the best possible results from the bottom of the back filled space to the top of the wall."*

Of course, this Commission had no power to alter the specifications and to substitute a puddling process for the process required by the specifications themselves. The quotation is made to demonstrate that even the substituted puddling was not properly done.

Alden, MacPherson, Sykes and Fleming state that large stones were deposited in the bank filling, which is another term for embankment, and that none of it was built in six inch layers, watered, rammed or rolled. MacPherson had a diary which showed the dates of the work (675).

MacPherson's testimony as to bank making along the side of the westerly reservoir on Sedgwick avenue, throws an interesting light on the leaky wall.

*" As we washed this (bank) material with the hose, a quantity of water accumulated behind the wall, and as it got up on the wall, we observed it coming through the wall and carrying some of the material through at the same time. In the winter time the water got back of that wall and formed quite a quantity coming through on the face of the wall, and hung down in large icicles "* (p. 674).

It is plain as the sun at noonday, that no further pointing could be done on the inside of the wall.

It is no wonder that, during heavy rains, this



portion of the bank fissured as described in Alden's letter of April 27th, 1903 (243). He says :

“ The bank just south of the overflow structure and extending from 21.90 to 23.60 is also in very poor condition, its top which is about eight feet below the crest of the wall being badly fissured and exhibiting various depressions. On April 25th, two holes revealed by inspection to be about one foot deep each had just been filled. *These fissures, shrinkage away from the wall, and depressions indicate a very serious internal disturbance of some kind.*”

In testifying as to the condition of this wall in April, 1903, Alden said the holes he described as one foot deep were five feet square and were depressions caused by the unequal settlement of the mass (248). On April 14, 1902 (a year before), Alden had called Ulrich's attention to the importance of this back filling. He says :

“ The overflow masonry will soon be in such shape that filling can be begun behind the wall. \* \* \* While this backing is being done and the derrick in place, the *loose rock debris, &c.*, should be pulled out from behind that part of the *defective retaining wall in the vicinity*, the wall properly cleaned, joints raked out and slushed on both front and back clear to foundation, *and the bank carefully tamped and watered. Too much care cannot be taken here*” (237).

When a man who writes so intelligently to his superior officer asserts that the specifications were not obeyed, his word is reliable. Had the bank been built as the specifications demand, or had it even been puddled with the care which the Burr-Freeman-Hering report would seem to require, none of these fissures and defects would probably have been exhibited. The loose rock and debris were never removed (MacPherson, pp. 688-9). It was either this fill or the fill east of gate-house 2 that

Alden characterized to Ulrich "as bad or worse than bad" (227).

Describing this portion of the embankment to which Alden alludes, Ulrich admits that it was not rolled (1061) because

"the physical conditions were that it could not be rolled, because the trench was so narrow that no roller or anything of that kind could be used."

"Q. It could have been rammed with rammers, I suppose? A. It could have been, yes.

"Q. And it was not, was it? A. A portion of it was.

"Q. Where is that portion? A. A portion near the waste-weir.

"Q. It could have been rolled I suppose after you got to the top, after you got the trench filled up to the level of the natural bank which you say was about elevation 125 at this point? A. Yes."

He then admitted that it had not been rolled after that, but that he "continued the building of it by the puddling process" (1062). He was then asked this question:

"Have you in building any banks that have been built while you have been there followed the method described in the specifications of putting the earth on in six-inch layers, rolling it with heavy grooved rollers or ramming it? A. No, sir, excepting in some small instances in regard to the waste-weir, we put that in layers and rammed it" (1062).

And he admitted that all along the west wall as far as the wall had been constructed, embankment had been made not in six-inch layers by rolling and ramming, but "by the puddling process" (1062), but sought to justify his disregard of the specifications by the assertion of his belief that an embankment made by the puddling process is "superior to an embankment rolled and rammed with this class of material" (1064), and that he followed Chief Engineer Hill's direction (1182).

Hill was asked :

“Did you know that banks were being built at the reservoir under the direction of the Division Engineer *by what he called a puddling process, instead of by ramming or rolling?*  
A. Yes.

“Q. How early after Mr. Ulrich came there was that method of building banks adopted?  
A. I have forgotten the date, it seems to me that it was in 1901 sometime” (1351).

As to the bank at gate-house 2, Hill says: I was there when they were about starting that work. The material was dumped from cars and a jet of water turned on it” (1352). This confirms what MacPherson said about Hill's presence. Hill was further asked: “Did you give any instructions to Mr. Ulrich not to build the banks in that way? A. No, sir.”

Hill argued that the bank on the west side of the reservoir could not be rolled because of its physical condition “because it was between the wall and the excavated material, the excavated bank” (1352). Even assuming that in a narrow trench rolling was impracticable, the fill should have been rammed with heavy rammers in all such places (see specifications), but no such course was ever adopted. In fact, Hill admitted that rolling was practicable after the bank reached a certain height.

“Q. Take the fill along Sedgwick Avenue, you have told us that the fill was puddled by your instructions? A. Yes.

“Q. That was the process that you directed to be adopted in place of ramming and rolling, and building in six inch layers? A. Yes.

“Q. *Now after the fill arose to the height of the natural bank what difficulty was there in constructing it in six-inch layers?* A. I don't know of any.

Q. *There was none, was there?* A. No.” (1489).

“Q. Did you give any instructions when the original surface level was reached then to change or vary the method of making the fill?  
A. No.” (1490).

The readiness with which these engineers ignored the specifications is literally astounding. The contract meant nothing so far as they were concerned. Of course, the simpler method of bank making which was adopted was advantageous to the contractor. The contractor was paid  $23\frac{1}{2}$  cents for earth excavation which included all bank making (Contract, Sec. 51, p. 28); that price has since been advanced to  $29\frac{2}{10}$  cents. It is far cheaper for him to excavate and transport the material than to make banks in the manner prescribed by the specifications.

THE OUTER EMBANKMENT ALONG KINGSBRIDGE ROAD AND JEROME AVENUE BETWEEN GATE-HOUSE 6 (Station 74) AND STATION 83.50 (about 950 feet) IS SUCH AN OUTRAGEOUS DISREGARD OF THE SPECIFICATIONS THAT NEITHER HILL NOR ULRICH COULD DEFEND IT.

All that is offered in extenuation is that the stones which went into this embankment were not placed there by the present contractor but had been dumped in by a contractor who was at work upon Jerome avenue (1088). *He was, however, permitted to go ahead and the embankment has never been removed.* Alden, Baldwin, Blauvelt, Craven, McKeon (a witness called for defence), asseverate that this bank is improper. Enormous boulders were thrown into it, there was no attempt to construct it in six-inch layers, nor to ram or roll it or to keep out stones exceeding three inches in diameter (pp. 465, 570, 571).

Baldwin testified: "Alden and myself spoke together to Ulrich about it", told him "the work was not being built in accordance with the speci-

cations" (593). Blauvelt heard Alden complain of it to Ulrich (616), and of fill at gate-house 2. This fill was also at a critical place—the lowest elevation, next to gate-house 2, on the entire reservoir (187, 572).

This piece of bank making was so bad that the Burr-Freeman-Hering Commission could not approve of it. Burr knew how bad it was when he visited the reservoir in July, 1903, *before he made his reports of July 27 and July 28 to the Aqueduct Commission*. Here the trench had been dug which he omitted to mention in the reports. Upon cross examination he was asked :

"Did you make any effort to have water retained in that trench? A. We did.

"Q. Were you cognizant of the reason why the water would not remain there? A. *It was very evident*.

"Q. *What was evident?* A. *The fill was made up of large fragments of stone to such an extent that the water ran away from them*.

"Q. Of course, that character of fill you would not approve, would you? A. *I should not* (p. 1399). In fact, I think we disapproved of it in our report" (p. 1400).

This last was not true, so far as the reports of July 27 and July 28 were concerned. All mention of the trench and of the bank was omitted from those reports as has been heretofore stated ; but on October 2, 1903, in a report made by Professor Burr to the Aqueduct Commission, which is dated long after the present inquiry had begun but not printed until the end of December, 1903, the following statement occurs : "In this connection we may report that during our tests of the tightness of the core wall near station 83 we found the upper portion of the embankment between the core wall and the street to contain many fragments of stone and material not suitably compacted. We have previously recommended *orally that this be dug out and refilled with suitable material*" (p. 21). Yet the fact remains that Burr and his associates



kept silent about this obvious condition of embankment from July until October, 1903.

Speaking of this long stretch of bank (750 feet) Ulrich himself says: "The embankment there is not an accepted embankment; that embankment must be made right" (1232). He, himself, suppressed from his own report to the Acting Chief Engineer all mention of the fact that the trench excavated in this embankment failed to hold water, although Assistant Engineer Baldwin had previously reported that fact to him in writing (pp. 576, 578, 606), and he admits that Professor Burr and Mr. Freeman were there when the trench was dug and knew of the failure of the trench to hold water (1233).

The specifications say that

"if any material found or brought on the ground for use in the work or selected for the same shall be condemned by the engineer as unsuitable, or not in conformity with the specifications, the contractor shall forthwith remove such materials from the work, and rebuild or otherwise remedy such work as may be directed by the engineer" (Paragraph 175, p. 51 of Contract and Specifications).

There has been no official condemnation of this embankment, nor would the public have ever known how iniquitously it was built but for this proceeding. There is no written criticism of it in the records and the probabilities are that but for the present inquiry the bank would have been approved. It certainly ought to be removed before any further payment is made to the contractors.

IN ALL FILLING AND BANK MAKING, WHETHER EAST OF GATE-HOUSE 2, WHERE THE TRESTLE WAS LEFT IMBEDDED IN THE BANK OR ALONG SEDGWICK AVENUE, WHERE, FOR A STRETCH OF 1900 FEET, THE BANK HAS BEEN IMPROPERLY BUILT OR ALONG KINGSBRIDGE ROAD AND JEROME AVENUE, WHERE THE BANK IS SO BAD THAT EVEN THE WITNESSES FOR THE DEFENCE HAD TO ADMIT THE FACT, THE SPECIFICATIONS HAVE BEEN WANTONLY VIOLATED.

Mr. Hill admits that he never applied to the Aqueduct Commission for permission to build banks by the puddling process instead of by ramming or rolling (1354). He had no right to depart from the specifications under the authorities heretofore quoted (see pp. 11, 13, 92, 93 of this brief). No recovery whatsoever should be allowed for any work which has been thus done ; certainly no portion of the reserved fund should be paid while the work remains in its present condition. Hill sought to excuse his deviation from the specifications on the plea that precedents had been established under Fteley and Craven. It was claimed by him and Ulrich that trestle or timber had been left by Craven in certain portions of the bank under the core wall. This was conclusively refuted by Craven (pp. 307, 308, 309). No trestle or timber was built into any bank other than the bank constructed by Ulrich (309, 317, 325, 326).

But even assuming that there had been some unauthorized deviation from the specifications under the Craven-Fteley regime, the city would not be estopped from insisting upon rigid compliance with their terms. The contract declares that no certificate given by any engineer or even by the Aqueduct Commission shall estop the city from showing the actual facts regarding the work. The conduct of Hill and Ulrich cannot be denounced in too emphatic terms. They pay no heed to contract or specifications, but permit the contractor to pro-

ceed with the work according to their and his own will. The astonishing thing is that their conduct seems thus far to have been condoned by the Aqueduct Commission. The city is assuredly entitled to protection. Its only immunity lies in exact compliance with the contract. It is no more open to the contractor or the engineer to deviate from the specifications without prior written permission of the Commission in one respect than another. As well might the engineer or the contractors claim the right to build a reservoir of the same dimensions or larger, upon ground of the same altitude, somewhere else, at less cost, as to ignore the specifications in any other particular. The matter seems too clear for argument.

#### UNNECESSARY EXCAVATION BEHIND RETAINING WALL AND UNDER GATE HOUSE 5.

Edward Wegman succeeded Mr. Craven as Division Engineer on the reservoir on March 12, 1900 (1624), and was superseded by Ulrich, on May 16, 1900. When he took charge, the face wall was in contemplation but had not been commenced. He stated :

“ The face wall was built according to a design made originally by Mr. Craven when acting chief engineer. It was to be a lining along the rock instead of a core wall and embankment. \* \* \* That wall was commenced while I was in charge and the exact point where it was to stop had not been determined when I left ” (1625, 1626).

Shortly after Wegman assumed office, Ridgway, his principal assistant, asked him to decide how the wall was to be built in cases where the rock “either accidentally or otherwise had been blasted too far back ”. He

“ told me that at some of the cross sections, if I would examine the ground, the rock was fully twenty feet back further than the lines given, and the contractors commenced to fill in from the line of the face wall to the solid rock which would have made a face wall something like twenty-eight or thirty feet thick on the top, instead of two and one-half feet. I decided that I would increase the wall two feet so as to make it strong beyond any peradventure, and then I instructed the superintendent of the contractors that in such cases he must make the earth embankment back of it which would probably not cost one-tenth of what the solid masonry would.”

Wegman at once informed Chief Engineer Hill of his decision which was reached on April 30th. On May 2, Hill visited the work.

“ He walked over the work and then went to the contractors’ office without making much comment, and then he asked to see the plan. I think the only person present was besides myself, Mr. Read, the superintendent of the contractors. Mr. Hill looked at the plans and asked me what my ruling was and he said ‘your position is perfectly correct’ ” (1628).

Hill masked his real feelings, for Wegman’s decapitation was already assured. Had the contractors’ wish prevailed with Wegman, the wall would have been twenty or thirty feet thick (1629) instead of eight feet, at its base. They started to build it that way (1639).

Mr. Wegman continued :

“ Nothing happened for a week or more. On the 11th of May I received a letter from Mr. Hill dated the *10th* transferring me back to Katonah in charge of my former division (1630). On May 16th, Ulrich assumed charge.”

The minutes of the Aqueduct Commission show that Ulrich had *applied* for the position of Division Engineer on the reservoir on April 24, 1900, and that his application had been referred to the Com-

mittee on Construction (Minutes of Aqueduct Commission for 1900, p. 71).

Wegman saw Ulrich on March 14 at McDonald's office, the day after Hill introduced him (Wegman) to McDonald (1631).

The episode which settled Wegman's fate occurred a week or two earlier than April 30. He found that the foundation for the central division wall had been blasted too deep, "probably four or five feet more than was necessary". His order was that they must keep to the grade, "so as not to waste masonry putting it in the trench where it was not needed". Read objected, exclaiming, "You are trying to save masonry". I said, "That is what I am here for".

This unnecessary excavation beyond the face wall which Wegman refused to have filled with solid masonry at great profit to the contractor, but ordered filled with bank material, ought never to have been made, for the Craven-Fteley plan contemplated a close bond between the face wall and the natural rock. It was, therefore, the duty of the contractor to fill this space with proper bank material in accordance with the specifications. That this was not done the Burr-Freeman-Hering report shows (p. 13):

"It is our judgment that the rock back of these walls should have been excavated so as to make the face approximately vertical, and with such alignment that the back of the wall would have been bonded to the rock face. As it is a space is left between that face and the back of the wall which should be filled and puddled with the best quality of material and with the greatest care. This does not appear to have always been the case."

No one can read the testimony of Alden, Sykes and other witnesses upon the point, without being convinced that unnecessary blasting took place beneath Gate House 5.

Close blasting of the reservoir sides and bottom



was required by the contract and compensated by higher rates (Contract, 44, p. 27). Hence, Ulrich's order to excavate the whole bottom of the Gate House area to El. 100 was indefensible. For the pipes beneath the Gate House a few trenches should have been excavated, without shattering the solid rock covering all its site.

#### MATERIAL BELONGING TO THE CITY CONVERTED BY CONTRACTORS TO THEIR OWN USE.

Material delivered by the contractors at the reservoir and paid for by the city has been removed by the contractors. Ulrich permitted removals in two instances :

(1). *Iron Pipe*.—Blauvelt, a clerk in the office under Ulrich said that seventy pieces of twenty-inch pipe were delivered by the contractors near gate-house 5, were weighed and allowed for in an estimate as material delivered. The price of the pipe was \$1,806 (629). Blauvelt testified that a few months afterwards he "had occasion to go to gate-house 5 when I missed the pipe, for the seventy pieces made quite a pile" and the place it had occupied was vacant. McMurray, inspector at gate-house 5, told him it had been loaded on cars and taken away but did not know where. Blauvelt then spoke to Ulrich who said : "Yes, it had been taken away from the reservoir." He had learned a few days before it had been taken away by the contractors (630). Blauvelt assumed that the price of the pipe would be deducted from the next monthly estimate, but Ulrich said "that Hill told him to allow it in" (631). The pipe was taken away in April, 1901 (631). Although the city had paid for it, no deduction was made until July 31, 1903, when the price was deducted from the estimate for that month (632). This pipe was

subsequently used by the contractors in the Rapid Transit work on Forty-second street (643). *No pipe* was delivered in its place until August, 1903 (632).

Attention is called to the fact that the deduction from the estimate took place while Mr. Jerome's John Doe inquiry was in progress. In all probability, but for that inquiry, no deduction would have been made, and it is fair to assume that no pipe would have been delivered in place of that removed. Such conduct on the part of a chief engineer and of a division engineer, is most extraordinary and most reprehensible.

Ulrich admits all that Blauvelt says, but shifts the responsibility upon Mr. Hill; but Hill denies that he ever knew of the removal of the pipe until District Attorney Jerome's proceedings.

(2). Read, the contractors' superintendent, also converted to the contractors' use certain cast iron constructions known as twenty-inch sleeves and twenty-inch curves, which had been delivered at the reservoir for use there and paid for, but the diligent Blauvelt, in checking up the material in stock, found they too disappeared (634). He subsequently discovered that they were used "up near the boilers that was on the old aqueduct at the pumping plant", a plant erected by Mr. McDonald for the Department of Water Supply, and Blauvelt subsequently had them deducted from the estimate. These sleeves and curves were taken from the reservoir in March or April, 1901 (635), and were deducted from the estimate in October, 1903.

Ulrich's leniency in the foregoing matters throws much illumination upon his methods at the reservoir, and reinforces the testimony we have adduced showing that he connived at loose and irregular proceedings, and permitted work to be done which was not in accordance with the specifications.

McDonald had impressed both him and Hill with the notion that the contract was unprofitable, and that any irregularities should be treated as venial.

As arbiter between the city and the contractors Ulrich never conceived himself as the city's fiduciary. The "contractor ought to get the benefit" (627). He "would see that the contractor got his rights" (734). Such were his utterances, which he has not had the hardihood to deny that he frequently employed.

*How Ulrich saw that the Contractors Got the Benefit.*

Most of the remaining specifications relate to the singular favors shown by the chief engineer (Hill), and division engineer (Ulrich) to the contractors. In order that the subject may be fully understood, the history of the changes in administration should be set forth.

Upon Mr. Fteley's resignation, Mr. Craven, then Division Engineer, was appointed Acting Chief Engineer (Aqueduct Commission Minutes, 1899, p. 213). Craven refused to accede to the contractors' request to substitute "rock dust" for sand, and was transferred to Katonah, notwithstanding Mr. Fteley's dignified remonstrance (see letters A. Fteley to Mr. Hill, and the Aqueduct Commission, p. 1553). Craven's deposition took place on March 8, 1900. Mr. Wegman was installed as Division Engineer on that day and continued in office until May 10, 1900. Upon Wegman's accession, McDonald interested himself to secure an advance in Wegman's salary, but Wegman's refusal to serve the interests of the contractor soon led to his removal and return to Katonah, whence he had previously come. His declination to permit undue excavation under the aqueduct division wall, his refusal to allow unnecessarily thick rubble wall to be built behind the face wall, have already been explained. Ulrich, an acquaintance of the contractor (Wegman first met him on March 14, in the contractors' office) (p. 1631), was then appointed

Division Engineer. Hill had taken office as Chief Engineer on January 1, 1900. Between that date and May 16, 1900, when Ulrich was installed, Hill had abundant opportunity to familiarize himself with the prices which Craven and Wegman had allowed to the contractors for broken stone and other material delivered to the reservoir. The broken stone was to be used in the making of concrete for the reservoir sides and bottom. Until the concrete was laid in place, strictly speaking, no allowance was due to the contractor, but the custom had obtained at the reservoir, as in other contracts by the city, of permitting the contractor to recover, as broken stone was delivered, a portion of the price eventually to be paid for the concrete masonry, when laid. In ascertaining what would be an equitable allowance, it had been the policy of Craven and Wegman to be conservative in the city's interests. The amount of broken stone was equated into an equivalent of the concrete masonry still to be laid, and the monthly estimates treated the work as *pro tanto* completed. Craven's allowance was fifty cents per cubic yard for such broken stone. Whether the contractors had protested against this allowance as insufficient, does not appear. But the fact is, that Ulrich signalized his accession to office by immediately advancing the allowance for broken stone to \$1.10 per cubic yard. Although well aware of the allowance made by Craven and Wegman, Hill never suggested to either that it was inadequate (1460).

"Q. Then you *knew* that the price that Mr. Craven and Mr. Wegman were allowing for broken stone was fifty cents a cubic yard? A. Yes.

"Q. Did you ever say to either of them that that price was too low? A. I don't recollect that I did.

"Q. Don't you know that you never did? A. I don't recollect of ever having spoken to them about it.

'Q. Don't you know, is my question, that

you never did speak to either one of them about it? A. No, sir; I do not. I do not recollect of ever having spoken to them about it.

"Q. Why didn't you speak to either one of them about it if you thought the price for broken stone was too low? A. It didn't occur to me.

(But such are the vagaries of the human mind that it did occur to him inside of fifteen days after Ulrich's appointment.)

"Q. Then it never occurred to you until after Mr. Ulrich superseded Mr. Wegman? A. It did not.

"Q. Allow me to finish my question. Until after Mr. Ulrich superseded Mr. Craven and Mr. Wegman to suggest that the price for broken stone was too low at fifty cents a yard, and it ought to be increased to \$1.10? A. Not until Mr. Ulrich took charge.

"Q. Have you any idea how such a suggestion from you would have been received by either Mr. Craven or Mr. Wegman? A. I have not the slightest idea" (1459, 1460).

The first estimate signed by Ulrich not only increased the allowance for broken stone, but enlarged prices for brick from \$5.00 to \$6.00 per thousand; a full list of the items of material delivered, the prices of which were simultaneously advanced, is as follows:

Prices advanced by Ulrich, in his first monthly estimate (estimate 57), May 31, 1900.

Item gg, broken stone, from \$0.50 to \$1.10 per cu. yd.

Item h, brick, from \$5 to \$6 per bbl.

Granite masonry cut stone, from \$25 to \$30 per cu. yd.

Item p, face work, rubble masonry, from 15 cents to 25 cents per sq. ft.

Item t, t, t, special castings, \$41 to \$50 per ton.

Craven made no allowance for cement, but Ulrich allowed \$2.00 per bbl. for Giant Portland cement, and eighty cents per barrel for Union cement (770). These increased prices added approximately \$16,000



to Ulrich's first estimate (p. 643). The allowance for broken stone, a few months afterward, fell back from \$1.10 to \$1.00 per cubic yard, and has since remained stationary. These additional prices were authorized by Hill on the ground that the former prices were too low. According to Ulrich, they had not even been requested by the contractors (p. 1260). If the contractors did not request the advance, it is a remarkable thing that the city's representatives should, of their own motion, have allowed these larger figures. By what esoteric knowledge Ulrich and Hill had familiarized themselves with the market prices of these different articles is not divulged. Practically none of the materials for which these allowances were made has yet been incorporated in the work. No concrete masonry has been laid, for work even in the westerly reservoir has not so far progressed as to permit of the lining of its sides and bottom. Wegman's last estimate, which was in April, 1900, shows material on hand (consisting of broken stone, brick and other items) amounting to \$51,387.71. The amount of material delivered but not embodied in any finished work amounted, on October 15, 1902 (the date of the supplemental agreement), to \$184,749.12, and on October 31, 1903, to \$222,165.03. The city's loss in interest upon the price of materials, piled up years in advance of their conversion into reservoir construction, will be enormous. The items (g and gg) which represent broken stone alone, amounted on October 31, 1903, to \$124,044. If Mr. Craven's price had remained unchanged, this item would have been only \$62,000, and the city in the last four years would have been saved \$17,000 in interest upon these items alone. It is extremely doubtful whether the contract ever contemplated that material should be accumulated at the reservoir long in advance of the date of its use. The more correct theory would appear to be that the contractors were to deliver material sufficiently in

advance of its being needed to prevent retardation of the work by lack of its delivery.

The most remarkable circumstance in connection with these advanced prices is that they relate back to the inception of the work and result in the payment to the contractors for materials delivered long prior to Ulrich's administration, of a higher price than that agreed upon with Ulrich's predecessor. In other words, closed transactions were re-opened, so as to enable the contractors to reap a benefit,—in some cases, amounting to 100%. It is doubtful whether the contract allows any such alteration. It provides for an estimate every month to determine approximately the amount of work done during the *next preceding* month. A strict interpretation of the contract would not authorize Ulrich to re-open any settlement between the contractors and the city made prior to his administration. For example, Ulrich took 10,712 cubic yards of concrete delivered during Craven's and Wegman's administration for which the contractors had received payment at the rate of fifty cents a cubic yard, and advanced the rate to \$1.10 per cubic yard. If the material was the property of the city and had been paid for by the city at the rates fixed by Craven and Wegman, the transaction was settled and it was not within Ulrich's power to re-open it. The utmost he could legally do would be to increase prices from the commencement of his own administration and even that would have been improper. Various other advances of prices for material delivered were made from time to time, as follows :

Later advances,—

Estimate 68.

h, brick masonry from \$6.50 to \$8 per 1,000.

tt, iron hub and spigot straight pipe from \$22 to \$25 per ton. (See pp. 770, 773).

## FALSE CERTIFICATIONS AS TO EARTH AND ROCK EXCAVATED.

Not content with reopening settled transactions in regard to broken stone, brick, cement, iron pipe, etc., Ulrich, with Hill's approval, undertook to recalculate the amount of earth and rock excavation done during Craven's and Wegman's regime. It seems that Craven had been generous to the contractors in this respect, as the records in his office plainly showed, and as he stated in a letter to his successor, Wegman. To impart some color, to give some seeming foundation to a criticism of Craven's work (although Craven could never learn, either from Hill or from the Commission, any reason for his removal), Hill directed Ulrich to disallow some excavation which Craven had allowed, amounting to about 18,000 cubic yards; and thereupon Ulrich set assiduously to work to recalculate excavation, first writing Hill :

"I shall not be satisfied that the contractor has been over-estimated, until I have had time to go into the detailed calculations of the work done prior to my assuming charge of the work" (p. 900). What zeal in the contractors' behalf!

The practice which had prevailed in the measurement of rock and earth excavation was for the Assistant Engineer and other subordinates to ascertain, upon the reservoir field, the amount of excavation from month to month, to transcribe the results of their examination in "field books", and then to plot the results of their notes on the field upon what are termed "cross section sheets of excavation." These cross section sheets show the changes in elevation at each particular cross section of the reservoir, in excavation done from month to month, so that taking any one cross section, having a particular number, it would be possible at a glance to observe the work done during consecu-

tive months in that particular cross section. Cross section sheets were made for sixty feet intervals, so that by mathematical processes well known to engineers, the cubical contents, or total excavation in cubic yards could be ascertained. Although Ulrich never undertook to remeasure the work done in the various months of Craven's administration—a thing which he manifestly could not do—he nevertheless altered the cross section sheets by drawing lines upon them, indicating that excavation had been actually carried to lower points than the cross section sheets had indicated. This was an inexcusable alteration of a record. Ulrich says nothing in extenuation, except that he consulted with Alden, who informed him that the excavation had been carried down to grade in different cross sections of the reservoir, although the cross section sheets showed nothing of the sort. Alden positively denies that he ever made such statement to Ulrich (p. 1673). By this means, Ulrich increased the amount of apparent excavation done months before he took office. The totals of these increases are tabulated in his testimony and amount to 19,000 cubic yards of rock and 19,400 cubic yards of earth (p. 1112, 1119). The regular plots on the cross section sheets indicating the area in elevation of the excavation from month to month prior to Ulrich's assumption of office, had been accurately measured by the planimeter. Ulrich discontinued its use and inaugurated the system of ascertaining the area by the use of his eye; his calculations always being advantageous to the contractors. By these means—using the eye as a factor in determining area and deliberately drawing lines upon the cross section sheets to show excavation to a lower level than it had actually reached in any month—he was able to swell the amount of excavation done during Craven's and Wegman's regime by the above-mentioned figures. Even assuming that he was authorized to reopen these transactions, his conduct was most reprehensible.

*It resulted in a virtual falsification of records.* As each monthly estimate was sent to the Commission, Ulrich had to certify, in one column, to the total amount of excavation to date; in another column, to the total amount of excavation shown by the last preceding estimate; and in a third column, to the amount of excavation done during the interval, that is, during the *preceding* month. It was demonstrated and was, in fact, admitted by Ulrich that, in the case of twenty-six cross section sheets upon which he had made these changes, *there had been no excavation whatsoever done since the commencement of his administration.* Secondly, his certifications were false, in stating that a certain amount of excavation—the increase over Craven's and Wegman's figures—had been done during the month to which his estimate related. To take a single example, shown in Mr. Blauvelt's testimony: Estimate 55 showed the total excavation in cross section sheet F 30x60, as 3,878 square feet to March 31, 1900. These figures remained unchanged in subsequent estimates because no further excavation had been made in that section. Estimate 63, for August, 1900, increased the amount of excavation in that particular section to 4,040 square feet, although no excavation had been made in the interval. This area, properly treated as above explained, represented a certain number of cubic yards of excavation. Although no further excavation was done, Ulrich, in Estimate 60 for August, 1900, deliberately certified that there had been an additional amount represented by the difference between 4,040 and 3,878, translated into cubic yards and so certified to the commissioners, and the contractors drew the additional pay (754, 756, 761-765, 1255, 1256).

An attempt is made to extenuate these changes by showing that they did not amount, all told, to much more than one per cent. of what will be the total excavation of the reservoir site. The princi-



ple is the same, whatever the proportion. Ulrich not only changed results which had been reached by his predecessors and certified to in the estimates forwarded by them to the Commission, but wilfully and deliberately certified to statements which are not true.

Ulrich also made allowances for slope where none had previously been made. The contract makes no such allowance except in the excavation of trenches. Neither Craven nor Wegman had made any such allowance, but Ulrich adopted the system of treating the side walls of the reservoir as trenches, and wherever blasting took place along the exterior boundary rock, he made the same allowance as would be made in the case of a trench. This was an obvious advantage to the contractor, was an innovation in practice, and was unjustifiable. The aggregate of these improper allowances for slope is \$4,158.55 (775).

These criticisms of Hill's and Ulrich's methods are not captious. The policy throughout seems to have been to benefit the contractors. Blauvelt testified that Ulrich announced early in his administration "that he would see that the contractor got his rights" (p. 74). In all matters of doubt, it was his view that the contractor ought to get the benefit (p. 627). Ulrich did not deny either of these statements. His conduct in these particulars sheds a flood of light upon his administration. A division engineer indulging in such lenient views regarding the contract might well be expected to excuse many delinquencies and tolerate workmanship and materials which a conscientious engineer, with a high sense of his duty to the public, would never have sanctioned. It cannot be denied, for it stands conceded, that he allowed the contractors to convert to his own use a quantity of iron pipe which had been delivered at the reservoir in April, 1901; that, although he knew of its removal from the reservoir site, he never deducted the price of the pipe (for which the contractor had been paid) until July 31,

1903, and then only under a species of compulsion ; that he likewise allowed the contractors to take away iron sleeves and curves ; that, at the outset of his administration, in his first estimate made only fifteen days after he took office, he increased the prices of broken stone, brick, cement and other materials ; that he advanced other prices from time to time ; that he allowed the contractors for unnecessary slope excavation, and that he recalculated the excavation which had been done prior to the commencement of his term of office, even going so far as to draw fresh lines upon cross section sheets and to certify to excavation as done during his own *regime* when, in fact, no such excavation had been made. In view of the engineering changes which had been made at the reservoir, the transfer and removal of division engineers, the loose supervision practiced by Ulrich, the inferior character of the workmanship and materials since May, 1900, the inference seems justly warranted that he was placed in command to look out for the contractors' interests, rather than the interests of the city. He was destitute of every qualification for the office. Prior to his appointment, he had been an engineer in the Park Department ; had built a wall at Spuyten Duyvil, which was unable to withstand the pressure of water against it ; "the pressure of water was too great behind the wall and the wall gave way" (1145) ; he had never had any other experience in hydraulic work, and none whatever in reservoir construction (p. 1145). To substitute such a man in Craven or Wegman's place evinces a heinous disregard of the city's interests. Mr. Fteley rightly remonstrated when, in March, 1900, upon learning that Craven, who had been connected with the work from the beginning, was to be removed to Katonah, he wrote to the Commission that "the change of engineers at this time, unless rendered necessary for weighty reasons, now unknown to me, should be avoided". Had Craven or Wegman continued in office, none

of the resulting scandals would have occurred. Neither Craven nor Wegman would have sanctioned the substitution of "rock dust" for mortar, or advanced the price of materials delivered, or allowed such a vast accumulation of material in advance of its incorporation into the work, or permitted embankments to be built in flagrant disregard of the specifications, or requested the substitution, in lieu of core wall and embankment, of an expensive masonry wall which, although proposed and adopted on the score of water-tightness, has been proved to be a leaky and practically worthless construction, nor would there have been the unnecessary excavation behind the face wall, against which Wegman expostulated, nor any unnecessary blasting upon the reservoir site. The espionage over contractors and workmen would have been strict, work would have progressed with diligence, and in conformity with the contract, and the reservoir would have been completed on time.

Hill, who owed his appointment to the influence of powerful politicians (p. 1451), was no peer of Alphonse Fteley, the designer of the reservoir, and no comparison can be instituted between either Craven or Wegman and Ulrich. Ulrich is ignorant of the simplest hydraulic principles. He was asked upon cross examination :

"Q. Do you know whether there is such a thing as the law of pressure of fluids upon the sides of the vessels which contain them?

A. Yes, sir.

"Q. What is that law? Can you state it? A. It would depend upon the depth of the water.

"Q. What do you mean by 'it would depend upon the depth of the water'? A. The pressure.

"Q. Can you state that law as an engineer? A. No, sir; not exactly.

"Q. I will ask you whether I state it correctly: Is this one form of statement: 'The pressure exerted upon any surface of a heavy fluid is equal to the weight of a

cylindrical or prismatic column of the fluid, whose base is equal to the surface pressed and whose altitude is equal to the distance of the centre of gravity of the surface below the upper surface of the fluid? A. I don't know.

"Q. You don't know? A. Not at present.

"Q. Aren't you an engineer? A. Yes, sir.

"Q. Isn't that an ordinary hydraulic formula or principle? A. Yes, sir.

"Q. Then why do you say you don't know? A. Because I would refer to my own text books to see whether that is correct or not" (pp. 1204, 1205).

THE GROSSLY UNPARDONABLE DELAY IN THE COMPLETION OF THE ENTIRE WORK AND THE LAMENTABLY BACKWARD STATE OF THE WORK IN THE EASTERLY RESERVOIR ENTITLE THE CITY TO DAMAGES. UNTIL THESE SHALL HAVE BEEN ASCERTAINED, THERE SHOULD BE NO ENCROACHMENT UPON THE RESERVED FUND.

The contractors lay great stress upon the fact that the City holds an indemnity bond of \$400,000, but this slender security was accepted because of the City's right to withhold ten per cent. of the contract price until ninety days after the completion and acceptance of the work. The existence of the bond cannot, therefore, either legally or properly, be pleaded as an excuse for impairing the reserved fund, the retention of the whole of which is essential, because of the inadequacy of the bond. The reserved fund and the bond together constitute the City's indemnity, and with almost equal reason the bond might be cancelled as the reserved fund decreased.

Damages have already accrued for the failure to complete Aqueduct North on November 1, 1902 (see p. 19 of this brief), and they should have been assessed under clause M of the contract.

The Commissioners have recently granted an extension of time as to the westerly reservoir, and, while the contractors are still under an obligation to finish the easterly reservoir on August 1, 1904, compliance with their agreement will be an utter impossibility, as the work in that reservoir is far behind that in the westerly reservoir. Acting Chief Engineer Cook, in his communication to the Aqueduct Commission of August 6, 1903, thus graphically depicted the state of affairs in the easterly reservoir :

"There are about 856 men employed on the work, 'an outlet railway' east to the dumping ground, which, when worked to its full capacity, can remove from 1,600 to 2,000 cubic yards per day of eight hours, working only eight hours in 24; also construction tracks, steam shovels, drills, derricks, stone crushers and other smaller plant. \* \* \* On August 1st last there yet remained to be taken out from the westerly section about 170,000 cubic yards, and from the easterly section about 1,556,000 cubic yards. As this material will swell about 30 per cent. in bulk when excavated and on the cars, the number of cubic yards to be transported from the reservoir, westerly section, will be 221,000 and from the easterly section 2,023,000. Then, with the existing outlet railway worked to a 2,000 cubic yard carrying capacity it will require from August 1 last 110 1/2 days, or about four and three-quarters (4 3/4) months, to remove the remaining material from the west section, and *1,012 days, or about three years eight months (3 2/3 years) to remove that which yet remains in the easterly section of the reservoir, or three years and ten months to remove all the material yet remaining, dating from August 1, just past, not taking into account inclement weather, during which no work can be done.*

"From the above it will be seen four years will have passed before the completion of this reservoir, unless something is done." (Minutes of Aqueduct Commission for 1903, p. 485).



According to this expert estimate at least four years must elapse before the easterly reservoir will be finished. Since this dismal prediction was made nothing has been done by the contractors to warrant the impression that the easterly reservoir will be completed even at that distant date. The same lethargy which has prevailed there for many years still continues. In fact, without the infusion of new and extraordinary vigor, it is doubtful whether the reservoir will ever be completed.

Analysis of the force or labor account up to November, 1903, shows that since October 15, 1902, when the contract prices were advanced by the Aqueduct Commission for the unfinished portion of the work, the contractors have actually had fewer men under employment than ever before despite the fact that the contract was placed upon the eight hour basis, the labor cost advanced twenty-five per cent., and generous extensions of time granted.

The force account at the reservoir prior to October 15, 1902, oscillated between eleven hundred and seven hundred men, the larger number having been employed in the earlier years. So far from adding to their labor force, putting two or three shifts of men at work as the late Mayor seems to have expected, the contractors have employed since October 15, 1902, according to the minutes of testimony (pp. 911, 912) an average of only 540 men; but even this reduced muster roll should be scaled down twenty per cent. as the men are now working only eight hours as against ten hours *per diem* prior to October, 1902. With the enormous amount of excavation yet to be done in the easterly reservoir (1,500,000 cubic yards) with a dwindling labor force, with the delays incident to possible changes of plan, including destruction of existing core wall and embankment and substitution of such "water-tight" masonry as has been erected in the westerly reservoir, who can predict when the work will be completed and

the City enjoy immunity from the peril which perpetually menaces it of an actual water famine? The City already has and inevitably will have a cause of action against the contractors for wanton neglect of a transcendently urgent public work. Should Manhattan and the Bronx be compelled, by reason of some break in the long aqueduct, to confront the awful danger of an absolute cessation of supply after a few meagre reservoirs have been emptied, or, what would be nearly the same thing, be forced to depend solely upon the old aqueduct for supply, the injury to property would be fabulous, widespread sickness would prevail and a startling death roll would be run up. What reason can the contractors plead for the payment and what justification can the Commission find for making them the advance which they persist in asking, in violation of the express language of the contract? The question of the contractors' liability to the city has become a vital one.

To relinquish any part of the reserved fund is to weaken the incentive to rapid progress. It is high time for the people of the city to demand that some adequate pressure be put upon the contractors; the day for favors and privileges has passed, and the time has come for the City's trustees, the Aqueduct Commission, firmly to insist that the reservoir must be completed, and sternly to refuse all further favors until that long-desired end has been attained.

#### THE CASE HAS BEEN CONCLUSIVELY PROVED.

We have, we maintain, shown the validity of all our specifications against the work, and thoroughly demonstrated the impropriety of any payment at this time out of the reserved fund. In the light of such a formidable mass of convincing testimony, no individual or private corporation would grant the contractors' request, and it is incumbent upon

the Aqueduct Commission as the guardians of the City's welfare, to apply no less strict doctrines than every private proprietor would invoke as reasons for denying such a request. The Commission, as the trustees of the City, cannot part with the City's funds if there be any valid basis for the assumption that our charges are just—charges which, we contend, have been thoroughly proved.

J. HAMPDEN DOUGHERTY,  
Counsel for The Merchants' Association.







## Before the Aqueduct Commissioners.

In the Matter

*of*

The Protest of THE MERCHANTS'  
ASSOCIATION against the pay-  
ment of \$200,000 of the retained  
amount upon the contract of  
Messrs. McDonald & Onder-  
donk, for the Construction of  
the Jerome Park Reservoir.

**Brief in Reply.**

In July, 1903, the contractors at Jerome Park Reservoir applied to the Aqueduct Commission for a payment out of the ten per cent. reserve of the sum of \$200,000, although it appears, by simultaneous reports of the engineers of that Commission, that the Reservoir will not be finished until August 31, 1907, in which event the reserve fund, which by the terms of the contract will not be payable until 90 days after the completion of the reservoir and its acceptance by the Aqueduct Commission, will not become due until the end of 1907.

The Merchants' Association opposes the payment upon various grounds, among others, that as the money is not due, it cannot lawfully be paid at this time. It claims also that the contractors are in default under the time limit for the completion of Aqueduct North; that they defaulted on the extended time limit for the westerly reservoir, and have recently received an undeserved extension until July 31, 1904, that it is admittedly im-

possible for them to complete the easterly reservoir by August 31, 1904, (the extended date for its completion,) and that it cannot be completed, at present rate of progress, before August 31, 1907. It claims also that the work has not been properly done and, to cite one specific instance, that the heavy retaining wall along the westerly reservoir leaks badly, and is an unsafe construction. Answer is made that the leaks do not surpass what might be expected of ordinarily good construction (although the witnesses who so tell us refuse to say how much a good wall should leak), and that when the wall shall have been fully built and shall have been thoroughly pointed up, the leaks will disappear.

While not conceding that leakage is normal, or that pointing up will obviate the trouble, it seems to us that the Commission ought to do what a reasonable and prudent proprietor would do in like circumstances,—withhold the payment of money until it had become due, in order that it might be determined, when the completed reservoir is filled with water, whether the leaks are extraordinary or not, and whether they would then disappear. Common prudence would commend this course to an individual or a private corporation, in analogous circumstances; and trustees are supposed to employ equal care and discretion in looking out for the interests confided to them.

While we maintain that the wall is inadequate for the purpose for which it has been constructed, we say, as a conclusive answer to the application for the payment (assuming it can legally be made at this time), that it is the duty of the Commission, as trustees of the city, to decline to honor the contractors' request. It should direct them to complete the reservoir. When both sections shall have been completed, they should be filled with water and the reservoir tested. If, when a head of twenty-six and one-half feet of water is enclosed within it, it is found not to leak,

the work may after ninety days be accepted and the final payment then made. Or, if the westerly section can be independently filled, the test can be applied upon its completion.

Our charges and proofs are not confined to the retaining wall alone. The work is grossly deficient in many other respects. Embankments have been constructed in total disregard of the specifications. Other reasons exist, all of which are enumerated in our first brief, why the payment should not be made.

The defence has been hit hard. The truth has struck home, and we witness the too frequent consequence, where the wrong-doer finds himself convicted. The briefs for the defence are full of spleen and vindictiveness, savage abuse and denunciation of counsel for exercising the prerogatives of his office, and blindly angry assaults upon the motives of the protestants, whose services to the public will be gratefully remembered when their detractors have passed into oblivion.

The late chief engineer and division engineer have succeeded in elbowing their way into this proceeding, and all the rights of litigants have been accorded to them. They have summoned witnesses in their own defence, and have, themselves, given testimony. They have cross examined our witnesses at great length; in fact, many of our witnesses have been subjected to double and treble cross examination. If any query eluded the ingenuity of the adroit counsel for the contractors, it was certain to be put by counsel for the engineers. It has long been a legal aphorism that a party charged with a certain course of conduct or the making of certain statements, who, having his opportunity for refutation, failed to deny the assertions of his accusers, is to be treated as having done or said the thing asserted. Yet we are censured for invoking this familiar principle, and for arguing that Hill and Ulrich could not or did not dare to,

deny that they had made the statements ascribed to them. We are twitted with having needlessly proved numerous things that are admitted, although only a *supra*-human prescience could have informed us that things stoutly denied, would indeed be admitted, after we had taken weeks to establish them so irrefragably that no sane person would dream of entering upon disproof. It is also claimed that we have asserted "facts," regardless of the evidence (whatever this may mean), and that "frequently, where the testimony of a witness is impregnable, he is called, in substance, a coward, a liar, a traitor," &c. Our arguments are characterized as "fierce philippics," "rancorous," "nasty," "cheap," "silly," "screaming," and then anger spends itself in anti-climax, and we are told that we "shall not be imitated in unnecessary vituperation."

One criticism, frequently repeated, is that we have misstated and distorted testimony, despite the numerous lengthy citations from it with which our brief is laden, and the hundreds of carefully verified references it contains to the pages at which the testimony is to be found; nor is the suggestion always veiled that the alleged mis-quotation is wilful. Those who make such charges should be careful to be impeccable themselves. We shall not emulate our adversaries in endeavoring to cull out all the numerous instances in which they appear to have been culpable. It should be assumed, that, as far as honorable lawyers can do so—with every allowance for inevitable bias—the attempt has been made upon each side to state the testimony fairly. It would expand this brief beyond the proper limits of a reply, if we should endeavor to be as searchingly minute as counsel for the engineers has been. What corrections we make will be stated without even the innuendo that the errors were the offspring of deceit or malignity.

After a careful perusal of the briefs for the defence, our conviction is unabated—is even stronger

—that our charges have been fully proved. The whole force of whatever real argumentation is employed by the defence is concentrated upon a few points, many of them of trifling consequence ; and much for which we have contended is passed over in silence. We have shown what a profound coma reigned at Aqueduct North, between the spring of 1900 and the summer of 1903, despite Mr. Fteley's letters to the contractors and to his successor Hill, urging that this all-important undertaking should be vigorously prosecuted ; and our analysis of the agreement of October 15, 1902, shows that no extension of time for the completion of this section of the work was included within that agreement, that the contractors should have completed it on November 1, 1902 (the date fixed for the completion of all parts of their contract), and that under clause M of the contract, damages should be assessed against them for their default. Instead of being penalized for their failure to conduct this most important undertaking to a completion, they have been rewarded for their delay by an advance in prices for this particular work (pp. 17-26, of Brief).

We have shown also that whatever excuse may be urged, but we do not admit there is any, for delays *prior* to the agreement of October 15, 1902, that agreement was a solemn compact whereby the contractors, in consideration of an increase in their remuneration, of upwards of \$464,000, stipulated to complete the westerly reservoir on August 31, 1903, and the easterly reservoir by August 31, 1904 ; yet the old familiar lethargy marks the work ; and we have put a very proper query for taxpayers to address to the Aqueduct Commission, viz., what satisfactory reason can be assigned for continuing the payment to the contractors of the higher prices fixed by the agreement of October 15, 1902, when the real object, both in law and equity for that advance, (which was, as ex-Mayor Low announced in



giving his vote for it, that the work should be completed within the extended time), not only has not been attained, but has not been expedited by any fresh show of zeal by the contractors, or any effective stimulus to the work? The city is paying the contractors an extra half million of dollars, in order to reach results—to get the work done—in the language of Mayor Low, “to shorten the time which will elapse before the completion of the reservoir,” the extra payments go on, results are not attained, but additional time has recently been again given.

As we ventured boldly, but respectfully, to criticize the recent agreement extending the date, as to the westerly reservoir, to October 31, 1904, we are told in the contractors' brief, that *the plans for the reservoir floor are still undetermined*; and it is said, “How the contractors could have completed this work with the plans for the floor of the reservoir still undecided upon is not clear to a dispassionate observer.” If these plans were not determined when the agreement of October 15, 1902, was executed, it would seem that a solemn farce was enacted, at the expense of taxpayers, because neither party to the agreement could have expected or intended that the westerly reservoir would be finished on August 31, 1903, with plans unsettled; and the same comedy would seem to have been re-enacted when the more recent agreement, extending the date of completion to October, 1904, was made. *Why are not the plans of the floor of the westerly reservoir settled? Will they be still undecided upon in October of this year?* One branch of the Burr-Freeman-Hering report, of July 27, 1903, deals with the treatment of the floor of this westerly reservoir (Report, pp. 7-10). Are the plans so difficult that they could not readily be prepared? Counsel for the contractors appears to overlook the fact that his argument, if sound, would convict the Aqueduct Commission itself of responsibility for the delay,

inasmuch as plans needed by his clients before they can go on with the work have not yet been prepared by the Commission's engineers. In other words, when we say to the contractors that they assigned their inability to get laborers to work for ten hours, as the excuse for their supineness prior to October, 1902; that the eight-hour law was thereupon made applicable to this contract; that the labor cost of the contract was advanced twenty-five per cent., and the contract made more expensive to the city to the extent of about \$500,000, that they thereupon entered into a solemn engagement with the city, in consideration of this promised bonus, to complete the westerly reservoir in August, 1903, and the easterly reservoir in August, 1904, their reply is, that no fault should be ascribed to them, and that the extension of time to finish the westerly reservoir recently granted is necessary because the reservoir engineers have not prepared the plan of the bottom, or even decided upon the nature of the flooring. We prefer to believe that counsel has not apprehended the real force of his observations, and that supineness is to be ascribed to the contractors, and not to the Commission. If the contractors are at fault, why should they receive further favors, in the way of extension of time, and why should the reserve fund, which, we argue, ought to be kept intact for the protection of the city against imperfect workmanship and accruing claims for damages, be cut into and reduced? If a large *bonus* and an allowance of increased time would not spur the contractors into activity in October, 1902, we are, we think, justly skeptical that the payment of \$200,000, now urged as needed to finance the undertaking, will be any more fruitful of result.

In the easterly reservoir, affairs are in a far more deplorably backward state. We convict the contractors, out of the mouth of Cook, Acting Chief

Engineer of the Aqueduct Commission in August last, of gross and inexcusable delay (pp. 131, 132 of our prior brief). In his report to the Commission, Engineer Cook demonstrates, by mathematical computation based upon the capacity of the plant installed, and of the force of men employed in the easterly reservoir, that the mere excavation of the rock to be taken out of that reservoir will consume until August 1, 1907, "not taking into account inclement weather, during which no work can be done." Engineer Cook's report was made nearly a year after the contractors had been voted a heavy *bonus* to secure expedition, and, according to ex-Mayor Low, in the expectation that two or even three shifts of men would be set to work, and an enlarged plant put into requisition. At the date of Cook's report nearly a year had been frittered away, and nothing done. Down to the close of the testimony in this proceeding, there had been no symptom of vigor—on the contrary, we demonstrated that the labor force was smaller than in preceding years,—smaller even than appeared upon the surface, because the men work now only eight hours per day, instead of ten, as formerly. And it seems that changes of plan are mooted in this reservoir. Years after the date when Mr. Fteley's projects should have given the community, a completed reservoir and relief from the strain of anxiety lest a break occur in the aqueduct, and an awful water famine be precipitated, engineers are still gravely debating whether the core wall and embankment construction of the easterly reservoir should not be torn down and replaced by a heavy retaining wall. Unless it be a sort of *lèse majesté* for taxpayers to ask the commission, how long this "cocained inactivity," this somnolent condition, already extending over years, is to continue, we think we are right in demanding that it should come to an end. The contractors need to be disciplined and it is the duty of the Commission to the people of this city, forthwith to give notice

to the contractors that this dawdling policy must cease, that they will be held liable for all the damages caused by their wanton and unnecessary delay, and that they shall not receive another dollar of the city's money, except as it is earned and falls due.

It is urged with great emphasis in the briefs for the defense, that the chief engineer was clothed with a sort of imperial authority to dispense with express and positive provisions of important specifications; hence that he had the power to substitute crusher screenings for sand, to say that embankments shall not be constructed as the specifications say they shall be, and to carry his commands into effect. To this untenable position is the defense forced, in view of the plain provisions of the act of 1883, and of the contract, set forth in our prior brief at pp. 7-11.

In support of their argument, they rely upon clause E, p. 15 and specifications, paragraph 3, p. 17.

I.—Mr. Carr places great stress upon clause E, which is as follows:

“And it is further expressly agreed, that all the work, labor and materials to be done and furnished under this contract shall be done and furnished strictly pursuant and in conformity to the following specifications and the direction of the engineer as given from time to time during the progress of the work under the terms of this contract and specifications which said specifications form part of this agreement.”

This clause is quoted in full at page 8 of the protestants' brief. In our opinion, the second portion of the clause is necessarily subordinated to the first.

(1.) A contract containing a clause similar to clause E, was recently construed by the Missouri Court of Appeals, in *Burke v. City of Kansas*, 34

Missouri Appeals, 570. The plaintiff, who had a contract to build a sewer, claimed that, upon the direction of the engineer, he laid certain pipes above the grade required by the specifications, and afterwards at the engineer's direction sank the trenches deeper and replaced the pipes, for which latter work he asked extra pay. The contract required strict fulfillment of the specifications, but contained a clause to the effect that the contractor was "to do and complete said work \* \* \* according to such directions as the city engineer may from time to time give in superintending the construction of the work, and according to the plans and specifications on file in the office of said city engineer, prepared for the letting of the contract for such work."

The Court dismissed the action, holding that the plans and specifications, which were made part of the contract, were to be followed just as zealously as if incorporated in the body of the agreement, and it said :

" If then the engineer could depart from the terms of the contract as to the depth of the sewer, why could he not substitute a smaller for a larger sewer pipe \* \* \* a 12-inch for an 18-inch sewer pipe, when the contract required the larger? This would admit the power in the engineer, while merely superintending the construction of the work, to change or modify the contract. This the engineer cannot do."

It was held that the words "according to such directions therefore as the city engineer may from time to time give in superintending the construction of the work" should be construed to mean such directions as he may give looking to a completion of the work *according to* the plans and specifications; and not to mean that the engineer might give directions for an improvement *in manner different* from that provided in the specifications.



(2.) The principle of this decision applies to clause E. It is the only rational interpretation of that clause and is in conformity with the decisions of our own courts.

Bonesteel v. Mayor, 22 N. Y., 162,

where the act of the Street Commissioner, in going outside of the proposals and specifications, was held void.

See other cases cited at page 93 of our former brief.

II.—Paragraph 3, page 17 Specifications, is as follows :

“ All work during its progress and on its completion must conform truly to the lines and levels to be given hereafter and determined by the engineer, and must be built in accordance with the plans and directions which shall be given by him from time to time, subject to such modifications and additions as said engineer shall deem necessary during the prosecution of the work, and in no case will any work which may be performed, or any materials furnished in excess of the requirements of this contract or of the plans or of the specifications be estimated and paid for, unless such excess shall have been ordered by the engineer, as herein set forth.”

Mr. MacFarlane says :

“ The contract confers on the engineer a general authority to make modifications in and additions to, *the plans and specifications*, from time to time, during the prosecution of the work, as he may deem necessary ”; and he makes the deduction that “ here is a broad general power conferred upon the engineer to modify and add to the work, that is, to the plans and specifications, whenever during the prosecution of the work he deems it necessary to do so.”

That the words “ work ” and “ plans and

specifications" are not equivalent and that the argument proceeds upon other fallacies, will be shown.

Comparison of the proposition quoted from Mr. MacFarlane's brief and the language of the specification (page 17), shows that the learned counsel has given the clause undue amplitude of meaning. It does not authorize the engineer to make modifications in and additions to the *plans and specifications*. Such a clause would have been at variance with the other provisions of the contract, and the specifications quoted in our former brief. There is no such inconsistency, because the clause states merely that *work* must be built in accordance with the plans and directions of the engineer, subject to such modifications and additions as he may deem necessary during its prosecution. "Work" is differentiated from "materials" in the language of the paragraph itself, for it is subsequently stated that in no case will any *work* which may be performed or any *materials* furnished in excess of the requirements of the contract, &c., be estimated, &c. This is not one of the "General Clauses", but a paragraph under a sub-head "Construction of Work". Hence this clause cannot be used as a basis for a change in the kind of materials required by the contract. If, as we have argued, the crusher screenings or rock dust are not sand within the language of the contract, no change of material is justified by the clause under discussion.

*But this clause is even more limited in scope.* It does not authorize the disregard of the express provisions of the specifications. It is to be construed in connection with them, not to be set *above* them, as the defence argue. Some limited power was intended by this clause to be conferred upon the engineer, for the reason, which is very well expressed by Mr. MacFarlane, that "in large construction contracts experience has shown that at the time when a contract is prepared all possible conditions that would arise in the course of construction can-

not be foreseen and provided for." It will almost inevitably happen that the progress of work will develop questions as to which some authority must decide; in other words, within the area fixed by the provisions of the contract, subject to them and governed by them, contingencies may arise where the judgment of some controlling authority must be exercised. While we hold no brief for Mr. Fteley or Mr. Craven, it might perhaps be said, that when they decided not to excavate for the core wall in solid rock, but to move the proposed wall further into the reservoir site, they possessed authority for this modification, under the clause in question. That was a mere change or modification in the mode of doing work, and involved no departure from the strict language of the specifications. But Hill thought otherwise and invoked the clause of the proposals requiring authority in writing, which he now tries to ignore. When Craven strengthened the outer embankment at the north end of the reservoir, by building it upon a slope of two and three-quarters to one, instead of two to one, without first applying to the Commission for authority, there was also a modification in the manner of doing the *work*, which in no way involved any departure from the express provisions of the specifications. Both these changes were beneficial to the city.

These are probably extreme examples. Questions must often have arisen and may still arise, regarding lines and levels and methods of doing work, but all within and in conformity to the specifications; and it is to such questions, and such only, that the clause relates. It constitutes the engineer an authority to decide wherever the *specifications are not explicit*, and forbids objection or opposition on the part of the contractors. It gives the engineer no czar-like power to nullify express provisions. Some arbiter must exist, and the specifications establish the chief engineer as such. Moreover it is only such modifications and additions as the en-

gineer may deem *necessary* which are permissible. This view was evidently entertained in the O'Brien case, for Mr. Justice Van Brunt, at General Term, says that "the engineer may modify the work and its manner of doing ;" he does not say that he may change the kind of materials or transgress explicit provisions of the specifications.

The defence perceives the argument that this clause is omnipotent, to be unsafe. There must, it says, be some restriction upon such a power, some limit beyond which the engineer cannot go. One important restriction, which it admits, is his lack of power to order *extra* work, although extra work might be justified under the word "additions", if the clause is to prevail over express provisions forbidding extra work except after certain essentials have been complied with. But the power conferred by this clause is not unlimited in *other* directions. It does not authorize radical or revolutionary changes in work. It makes the engineer, not an autocrat, but merely an arbiter. Subject to express provisions, he may modify the manner of doing work, but he cannot escape from the positive trammels which the contract and specifications have built up. The whole theory of the Act of 1883 and of the decision in the O'Brien case, is at variance with the contention of the defence.

A word of comment upon the reason for Hill's changes is not out of place here. Not one of the unforeseen contingencies or emergencies to which counsel for the engineers alludes, had arisen. There was no emergency of any kind which required the substitution of rock dust for sand, or the abandonment of the method of bank-making, so rigidly prescribed in the specifications. Proper sand was procurable, if not at Jerome Park, at least elsewhere, upon the payment of a proper price. Nor was there, as the engineers now admit, any real difficulty in building banks as the specifications demand, except that the method was more

onerous and less lucrative to the contractors. As we have already said, these changes did not originate in any necessity, any unforeseen contingency, but were plainly inspired by the desire of the engineers to benefit the contractors. There is not a particle of evidence that they were advantageous to the city, whereas, assuming they could be lawfully made,—which we dispute—the evidence should be conclusive that the city was a positive gainer by change.

Summarizing our argument it is:

1. That no power is conferred upon the engineer, by the clause under consideration, to change the specifications. Hence he cannot substitute screenings for the sand called for by the contract. No power to make such a change is given to the engineer by any clause whatever.

The defense argue that, even if the chief engineer had not the vast powers they claim for him, it is competent for the Aqueduct Commission, *nunc pro tunc*, to approve of his conduct in casting the express provisions of the specifications to the wind. We do not so interpret the Act of 1883, or the decision in the O'Brien case. The letter of the act and the spirit of the decision plainly fix limits, even to the powers of the Commissioners, and they have, we earnestly insist, no authority to write a new contract, to make new specifications or nullify existing ones, other than that given in the contract. Except as such changes are authorized in the proposals, they are not authorized at all. But even if the power existed, the moral question would arise as to the propriety of its exercise. Here, an engineer has deviated from the specifications without the slightest necessity for his doing so. It is not shown that sand could not be obtained and that this great enterprise would be balked unless crusher screenings were substituted, nor is it shown in the testimony that gneiss crusher screenings have ever been used by any competent engineer.



It is not shown that the embankments could not be rammed or rolled or built in 6-inch layers, or that it was necessary (the mere suggestion is ridiculous) to dump enormous boulders into them. It has not been shown that puddling had indispensably to be employed.

2. The clause, par. 3, p. 17, of Specifications, does not permit the engineer to delete from the specifications, express provisions as to the mode of building embankments, and to substitute some other mode of construction. If he could violate one provision, he might infringe any other, and thus whittle away all the safeguards with which the specifications have surrounded the construction of the work. The engineer is not made an ultimate authority *superior* to the specifications. There would be no sense in their careful and elaborate phraseology, if the engineer, at his pleasure, could dispense with them altogether, and direct the work to be done in some different manner, as he might deem best. The defence perceives the weakness of its own theory, since, while saying there must be some restriction upon his power, it is unable to fix the limitations.

3. If its argument were valid, the engineer had power to substitute a retaining wall for the core wall and embankment, without prior written authority from the Commission, yet he sought and obtained its authority before going ahead.

It is argued by the defence, that Section 2, Chapter 490, Laws 1883, confers authority upon the Commission to "make changes of plan". Assume this to be so,—this is not authority to change *specifications* or disobey their express provisions. Of course, it is not a change of plan, within the proper meaning of the word "plan", to substitute crusher screenings for sand, or "puddling" for the prescribed method of building embankments.

As the Court of Appeals and the statute declare, "the city shall not be held for any *other* or greater

liability than that expressed therein (in the contract), nor required to pay out or otherwise dispose of any sum of money for the doing of such work, or the furnishing of such material greater than is stipulated in such contract, nor otherwise than in strict conformity to the terms thereof.”

Hence, we repeat, the law applicable to this case has been settled.

The proposals are, we repeat, a part of the contract, being conditions upon which the contract was predicated and the work let.

But if the proposals are not part of the contract, there exists no power, even in the Commission, to vary the specifications.

Unless, therefore, crusher screenings are sand, their use is absolutely prohibited. So, likewise, embankments must be built as the specifications require, or the work is not done in accordance with the contract.

That the crusher screenings are not sand has been conclusively shown.

The contention of the defense that crusher screenings fall within some dictionary definitions of sand has been answered in our previous brief (p. 92). As was there said, if artificially pulverized rock is to be treated as sand, crushed lime-stone, which is absolutely destitute of silica, would be sand—a plain contradiction in terms.\*

Our argument that the words “free from loam” necessarily import natural sand, is attempted to be met by the claim that dirty earth-covered rock might contain loam. This illustrates the desperate straits to which the defence is forced to resort. If it had been intended that the rock blasted out of the sides and bottom of the reservoir site might be crushed into screenings, the idea of guarding against the possible admixture of a small amount of adherent loam would never have occurred to anyone, whereas, if sand was to

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\*It screenings are sand, why did Craven's objection stand; why did the contractors not appeal to the Aqueduct Commission?

be dug, it would be a most natural thing to require that it should be "free from loam." How much loam would remain attached to blasted boulders, which have to be broken again for transportation from the ground, and again broken into separated sizes for concrete? Obviously none. But as loam, being a non-coherent mixture of sand and clay, is likely to be found wherever pockets of sand exist, the wise draughtsman of a contract calling for natural sand would, almost as a matter of course, provide that it should be free from loam. The word "clean" would have been sufficient in the case of rock. The adjective "sharp" connotes sand, for the broken rock would naturally have sharp edges. Hence we repeat, the words "free from loam" import sand, not screenings. While the defense has gone outside of the testimony to quote an alleged specification in use in the Navy Yard, the citation helps our cause. It reads that "screenings \* \* \* *acceptable to the engineer* may be used *in place of sand*, where the latter is specified," plainly demonstrating that sand is sand, and that wherever screenings are to be permitted, explicit provision is made for their substitution.

Our argument that the courts will not allow interpretation of a word which has an ordinary meaning, but will assume it to have been used in its customary sense, is passed over in silence, the reason being that this plain *dictum* of the courts cannot be gainsaid.

Nor, as we have already said, is there the slightest proof that crusher screenings or rock dust were recognized, in 1895, when this contract was let, as artificial substitutes for sand. The defense know this, and having no possible reply to make, pass this point in silence.

The entire effort in the briefs presented by counsel for the defence is to give a personal aspect to all the matters in controversy, whereas the personal

element has been studiously avoided in presenting the case of the Merchants' Association, except in so far as it was necessary and proper to show motive on part of witnesses. The defence refer to the reports of Professor Burr's committee as conclusively establishing the sufficiency and integrity of the contractors' work at Jerome Park Reservoir and their briefs assert our arguments in criticism of the reports and of the conduct of Professor Burr, to be "unintelligible". There is an objective, as well as subjective phase to "unintelligibility"; we think our position was clearly and concisely stated, but in view of the misconception of counsel for the defense, it may properly be re-stated.

The Merchants' Association, prior to February of last year, presented to the Mayor a number of charges against the Aqueduct Commission and requested him to cite the members of the Commission to show cause why they should not be removed. Several of the charges related to work at Jerome Park Reservoir. As the Mayor was unwilling to take such action, a conference was arranged between the Committee of The Merchants' Association and a member of the Aqueduct Commission, which was held at the Mayor's house on February 10, 1903, and to this conference the Mayor invited Professor Burr also. The Association's charges were discussed, and finally, at the suggestion of the Mayor, it was agreed that so much of its complaint against the Aqueduct Commission as related to the engineering questions at Jerome Park Reservoir, should be referred to Professor Burr's Additional Water Supply Commission. Professor Burr had hardly entered upon this special task before, without the knowledge of the Association, he was tendered and accepted the place of consulting engineer to the Aqueduct Commission at New Cornell Dam. A few months later, but before the duties referred to his Committee by the Mayor had been discharged, he became consulting engineer at Jerome Park



Reservoir as well. The first report of Professor Burr's committee, in its opening sentence, admits that these questions were referred to it by the Mayor, and one of the briefs for the defence declares, that the Burr Committee was "appointed to investigate the charges of The Merchants' Association" (p. 54).

The Merchants' Association expected and was entitled to an impartial report. The "reference" (we use the words of our adversaries) was plainly in the nature of an arbitration. This was the assumption both of the Aqueduct Commission and the Merchants' Association. Both parties to the controversy supplied the Burr Special Committee with its documents and views. Yet during the course of this reference and without our knowledge or assent, Professor Burr entered into the service of the Aqueduct Commission, at a compensation, and this conduct is sufficient to vitiate the reports altogether.

It is cunningly argued that at the time when we accepted him as a referee, he and his associates (Freeman and Hering) "were in the employ of the city as a commission of experts" (MacFarlane's brief, p. 54). *But Burr was not at that time (so far as we know) in the pay of the Aqueduct Commission, for the Burr-Freeman-Hering Additional Water Supply Commission was paid by the Department of Water Supply, Gas and Electricity; and the fact that he entered into the service of the Aqueduct Commission, while acting in a reference to which it was one of the parties, ipso facto disqualified him from proceeding with the investigation, and renders his report a nullity.* That is why,—again to borrow from the counsel for the defence, words, which show that in their unconscious mental operations they also regard Burr as an arbitrator or referee, we "dispute the findings of the report" (p. 52). The reports, when filed, were printed and circulated, were commented upon in the press, and were treated as a defeat for the Association, at whose in-



stance, it was said, the matters in controversy had been referred to Professor Burr's Committee.

While the obligation imposed upon this special commission by the Mayor was not, technically speaking, an arbitration or reference in a legal proceeding, it stands, in the forum of morals, as equivalent. Whoever wishes to take refuge in such petty technicality as the plea that this was not a legal arbitration, is entitled to the benefit of his narrow opinion. Had there been, in some legal proceeding, a definite agreement by the Commission and the Merchants' Association to refer these questions to Professor Burr's Commission, and had he accepted the retainer of the Aqueduct Commission during the course of the performance of his duties as arbitrator, and the decision of his Commission been favorable to the Aqueduct Commission, there can be no question that a Court of equity would have set it aside.

Morse on Arbitration and Award, 536,  
537 ; Article Arbitration and Award  
Am. & Eng. Enc. of Law, Vol. II,  
632, 634.

It is familiar law that the Courts condemn all transactions between an arbitrator or referee and either of the litigants, which may possibly tend to create a suspicion of partiality.

In *Fortunato v. Mayor*, 31 App. Div., p. 271, the Court vacated and set aside the report of a referee who, it subsequently appeared, had for years been employed as counsel for the city in various proceedings, as the other party to the litigation had no knowledge of the relations between the referee and the city. The Court said :

"Before such an appointment could be upheld, it must clearly appear that the relation that existed between the Referee and one of the parties was communicated to the other party, and was fully appreciated and understood by him" (p. 273).

Quoting from the opinion of Mr. Justice BARRETT, in *Reynolds v. Moore*, 1 App. Div., p. 105, the Court said :

“The real question here was not whether the referee was guilty of actual corruption, but whether the fairness of his decision was justly questioned. It is the settled law of this State that any indiscreet action of a referee from which improper inferences can be drawn, suffices to set aside this report. \* \* \*

“The referee is a man of most unquestioned uprightness. None sooner than he would have spurned an attempt improperly to influence his decision. \* \* \* A referee, under such circumstances, owes it to himself, not only to avoid all improper influences, but even the appearance of evil. Whether satisfied with the decision or not, no one should be left for a moment to question its fairness.”

And in another of the cited authorities, it was said :

“That the fact that the referee is a man of high character and unquestioned integrity, should not be allowed to influence the determination of that question. \* \* \* And the Court will enforce the rule against the man of high character as well as against one whose character is not so good.”

In *Stebbins v. Brown*, 65 Barb., 272, held :

“Nor does the Court deem it important to inquire whether the decision of the referee was or was not affected favorably to the plaintiff by his retainer in the matters above mentioned, for we regard such an inquiry as immaterial. \* \* \* The rule should be inflexible that such a fact will, *ipso facto*, avoid the report of a referee. No other rule will protect the referee from the approach of temptation or shield the administration of justice from the suspicion of impurity” (p. 276).

If Burr by his conduct, whether it involved moral turpitude or not, disabled himself and his associates from making a report that can be held

to have any integrity (and the courts declare that the disqualification of one arbitrator or referee affects his colleagues), we might justly have argued that the reports should not be considered at all. We objected to their introduction in evidence, as not in the nature of legal proof, and the Commission in admitting them, ruled that counsel for the Association might be allowed to cross-examine the signers (M., p. 1368). But after Professor Burr's cross examination, neither of the other signers was produced. Excuses (?) in profusion for not calling them, may be found in the briefs for the defence, but these excuses will not be found in the record in this proceeding, and if they had been, they are too puerile for notice. A letter said to have been addressed by Mr. Freeman to Mr. Carr (we do not mean to question its existence, but we did not see it, and perhaps counsel has quoted what he thinks its purport, but not its precise terms) was referred to at one of the sessions. If Mr. Freeman said in the letter, that he had been called out of the jurisdiction of the Court, he subsequently returned to it, and came again and again until the work of the Additional Water Supply Commission, of which he was a member, had been completed. Hence he could readily have been subpoenaed. There is not a scintilla of testimony or even suggestion in the record, that Mr. Hering, who does business in this city, could not easily have been found here. If counsel for the defence are to be at liberty to travel outside of the record at will, giving ourselves equal latitude, we may say that Mr. Freeman was in New York City long after the conclusion of Professor Burr's examination, and on at least one subsequent occasion visited the office of counsel for the Merchants' Association.

Mr. Black has been continuously out of the country for months, so that the Association has never had opportunity to cross examine him regarding his tests. Black's tests were subjected to some criticism in our

former brief, which, however, omits mention of one ground for discrediting them, not then known. The records of the Aqueduct Commission show that he, as well as Professor Burr, was in its pay. Upon the approval of his bill, by Professor Burr, the Commission voted to pay him \$200 for making the tests (Min. Aq. Com., 1903, p. 537). This was unknown to us until months after Black's work was done and his report filed. Without intending to traduce Mr. Black or to imply that he was a bribe-taker, or the Commission a bribe-giver, we may pertinently ask: "If Mr. Black was employed by the Aqueduct Commission through Professor Burr, to make special tests of screenings for it—which way was his judgment likely to incline? Upon Professor Burr's cross-examination, his attention was called to the unfairness of some of Black's comparisons between the screenings and sand.

The defense argue that the Burr reports conclusively establish the sufficiency and integrity of the work at the reservoir. On the contrary, we think that no unbiased man of intelligence, whether engineer or civilian, who reads the reports and the testimony, can come to any such conclusion. Evasive to the last degree, they omit mention of many topics upon which the facts required a report adverse to the engineers and the contractors, and, when constrained by palpable evidence to report adversely, they minimise, gloss over and excuse. The late Professor Tyndall somewhere alludes to the passion of the scientific mind for exact certitude, as a species of religion. Scrupulous attention to truth should be expected of the scientific student, especially in the determination of questions fraught with such importance to the community, as the questions referred by Mr. Low to Professor Burr's Committee. The method pursued in testing the wall was inadequate

to determine the question, the correct answer to which vitally concerns this community, *i. e.*, Will this westerly reservoir leak, when it contains twenty-six and one-half feet of water? Behind certain stretches of this wall, trenches natural or artificial, none of them over five feet deep, were filled with water, and its influence upon the wall, contemporaneously observed by Alden on the one hand and the Burr Commission on the other. As to one space of two hundred feet (stations 24-26) both sets of observers find measurable leakage of at least 1000 gallons in twenty-four hours; behind another stretch, 296 feet, Burr finds practically none, while Alden measures 1054 gallons per diem. One leak, noted by Alden, as carrying 558 gallons a day, (surely large enough to be mentioned and noted by the scientific observer), Burr does not seem to have found at all. In both these stretches water percolated through the wall so as to wet the greater part of it,—is described as flowing freely by Alden,—which is not seen at all by the Burr Commission. Over other stretches of this wall, no examination whatever was made. One inadvertent error has been detected in our brief, but not exposed without the ordinary accompanying charge that it is “a misstatement (to use a mild word) so gross that it should be noticed.” Our statement was that Burr admitted that his Commission did not test the wall between stations 36.40 and 39.36. This should have read “between stations 49 and 56 (700 feet), where the wall was fully completed (Burr, 1402). Asked why it was not tested, the Professor answered that the subject was discussed “to a limited extent only, but I cannot answer for my colleagues in this respect; but my examination of that wall had shown that there was some water lodged behind it naturally and that test, along with the examination I had made of the wall during its building, was sufficient at least for my purpose.” Alden examined this section of wall after a



violent storm in October, and reported upon its bad condition (pp. 42-44, our prior brief). This long stretch of fully completed wall should have been tested by the entire special commission. There were other sections of this masonry where no examination whatever was made. Either Alden, who found 1054 gallons between stations 36.40 and 39.36, was wrong, or the celebrated engineers, whose decorations and numerous official positions are blazoned in the brief for the defense, who found less leaks here than in any other stretch, must be mistaken. These shallow trenches, placed at intervals, can give no conception how much the wall will leak, when subjected to the pressure of a head of twenty-six and one-half feet of water. *Non constat*, but that at the very points where there were no trenches, leaks would have been disclosed. Leaks having been conceded, water having flowed through this retaining wall so freely that its plashing could be heard at times (M., 420), and that in the winter it formed great masses of ice upon the face of the wall, (our brief, pp. 36, 44), we maintain that there can be no adequate test applied to it until the reservoir has been completed and filled with water.

Not only was the method of testing the wall adopted by the Burr Commission defective, not only is there a remarkable discrepancy between the results of simultaneous investigations conducted by Alden, in the discharge of his duty, on the one hand, and by Professor Burr upon the other, but, in addition, there appear to be grave omissions from the Burr reports, excusable, perhaps, in a report of minor consequence, but not compatible with the high standing of the engineers, the grave importance of the inquiry, or that strict regard for absolute verity which science exacts from her votaries. Trenches were dug in embankments to test the core wall, and, incidentally, the character of the bank filling, which, we maintain, was to be examined by the Special Commission. A trench dug

in a stretch of embankment built by Ulrich, at once revealed the fact that the bank, over 700 feet long, was hopelessly bad ; and as the trench failed to hold water, no test could be made of the wall along this stretch. Another trench, simultaneously dug in Craven's bank, held water, and permitted a test to be made of the core wall in front of it. No mention is made in the Burr reports, which were so widely heralded as refuting all criticisms, of the fact that any trench was dug in the Ulrich bank, or that that bank had been built of great stones, &c., in total disregard of the specifications. Although Professor Burr knew that trestle had been left in the bank, east of Gate House 2 and admits that he disapproved of such construction, the reports were silent upon the subject. And in deciding the question whether the rock-dust or gneiss screenings substituted by Hill and Ulrich for sand, would make equally good mortar (while conceding, as was unavoidable, that "micaceous material should carefully be excluded from screenings," because of its pernicious quality), Burr cited case after case, where crusher-screenings have recently been employed, but cited them in such a manner, intentional or otherwise, as to convey the impression that gneiss screenings were sanctioned by eminent engineers, whereas the fact is that the screenings referred to by these authorities were either of crushed lime-stone or crushed slate or quartz (in no instance gneiss). The Burr reports in citing specific cases of the use of screenings say also that screenings were used *in lieu* of sand, whereas upon his cross examination it was shown, that the use was not a substitute for sand, but an *addition to* sand. \* We cannot for-

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\*Richardson, who was much fairer, was asked by contractors' counsel to coincide with the view of the Burr report that crusher screenings are being used as a *substitute* for sand in hydraulic mortar. His answer was there is a growing tendency to the use of crusher dust as a *constituent*. Q. To the exclusion of sand ? A. I could hardly state that to be the case (M., 1297).

bear quoting an answer of Burr's upon cross examination upon which the defense lay great stress. Inasmuch as his report revealed that the wall between station 24 and 26, passed or "appeared" to pass 1000 gallons of water in 24 hours, and as the same report, evidently considering this condition sufficiently serious to require explanation, ascribed it to the fact that "this portion of the masonry was built in winter," indicating the unwisdom of "attempting to lay water-tight masonry in freezing weather," Professor Burr was asked whether a leakage of 1,000 gallons in a day would indicate a greater flow than is consistent with good masonry. After declaring this to be one of those "obscure quantitative considerations where it is impossible to state definite figures," he continued: "It is, I think, a very small quantity of water for good construction to pass, and I am not ready to state positively that it is more than good construction should pass. But it does have the appearance of being perhaps more than should pass." This Delphic utterance challenges comparison with the unpunctuated answer of the famous oracle to the inquiry of an ancient general, as to whether he might safely lead a certain military expedition. The oracle replied: "*Ibit redibit non ibi morietur.*"\*

Sufficient has been said about the Burr reports, nor do we think that our criticisms have transcended the limits of decorum. But improper criticism (we do not justify it) of persons of conspicuous place, hardly implies lack of courage or a spirit of sycophancy, in the critic, whereas only petty natures can find gratification in unwarranted assault upon subordinates of ordinary station, whose only fault is that they have served the interests of the city which employs them with a fidelity that some of their superiors might worthily strive to

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\* He will go, he will not return, he will die there," or "He will go, he will return, he will not die there."

rival. It has, we happen to know, required no inconsiderable heroism for these humbler officials to brave the peril and the odium attendant upon speaking the simple truth, which affixes a higher evidentiary value to their statements.

This "water-tight" retaining wall has never been properly or sufficiently tested, and no test fully adequate to determine whether it will withstand the pressure of  $26\frac{1}{2}$  feet of water can be applied to it, before the reservoir has been completed and filled. Trenches "three to five feet in depth \* \* \* put near the top of the wall",\* could not enable anyone to determine how much the wall would leak when the reservoir is filled with water (and this is the uncontradicted testimony of our witnesses [495, 941, 1245]). *How about the long stretches of intervening masonry where no test at all was applied? There is a fatal deficiency of proof from the experts for the defense to show that the methods of the Burr-Freeman-Hering Commission possessed any efficacy.* Not one of them combats the evidence given by many of the protestants' witnesses, who were but stating a recognized law in hydraulics, that "such shallow trenches would not enable the Commission to make a fair test". As this issue of the utter inadequacy of these trenches was squarely and fairly raised by the protestants' proofs, the failure of all the opposing witnesses to defend the three to five feet test of a wall thirty feet high, is conclusive proof of its indefensibility,—to borrow the eloquent language of the contractors' counsel, "is a most eloquent, though silent, confession of defeat." In the few lines (p. 57) of the brief for the engineers, devoted to a reply to our argument, it is not pretended that there was any proof from any engineer or lay witness, that you could tell how well a thirty foot wall was constructed and how im-

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\*We quote from the defense.



pervious was its mortar to the pressure of water, by filling a three or five feet trench back of occasional parts of its top, with water. Any attentive reader of Alden's reports will perceive that the numerous leaks therein noted, appear at elevations, invariably far below the lowest depth to which the Burr test trenches descended. It was shown by the protestants, and admitted by Burr, Hill and Ulrich, that a column of water of five feet depth would not exert the pressure upon the wall, of a column  $26\frac{1}{2}$  feet deep. Burr's only excuse for not carrying a trench, at any point, to the bottom of the wall, is that the fill behind the wall was "almost certain" to be permeated by a thin column of water which would descend, to the bottom or nearly to the bottom of the wall; but it is only through the thin line of its descent, that the full pressure of a column of water as high as the wall would be exerted. It shocks the intelligence, as it offends the moral sense, to be told that a few columns of water trickling down here and there to the base of the wall, are competent tests of all the wall throughout its entire breadth and height. What do these little trickling streams tell us of the vast spaces (in comparison), where no water found its way to the bottom of the wall? Yet even this inadequate test gives us 1,000 gallons a day in one space of 200 feet, 1,054 gallons in another stretch of 296 feet, etc.

Had the trenches been extended to the foot of the wall the water pressure at its base would have been fully exerted and would have shown up all defects there as well as at the crest. But even such trenches would not have shown anything about the permeability of the other portions of the wall back of which no trenches were dug.

Not only was the utterly useless trench method incapable of testing the wall, but the leakage which did result was even less than is to be expected when the flow of water takes place from the reservoir, in the opposite direction. All the witnesses agreed, and it was said in our former brief,



(p. 61), that the "bank filling which is carried by the water tends to close the pores in the wall and to render it impermeable, whereas when the reverse process takes place, and clear water flows out of the reservoir, there will be no silt material carried." The silt which was carried by the water in the Burr trenches into the wall tended to close the pores in the mortar and reduce the flow into and through the masonry. But clear reservoir water will contain little or no silt (M., 510, 511), and the flow outward from the reservoir into the wall will not be impeded because of its presence. No proper drinking water would carry enough silt to close up leaks; if it did it would muddy the water and the water would be totally unfit for use.

From every point of view the celebrated tests of the Burr-Freeman-Hering Commission are found to be no test at all. *The test will come, and it will be the first genuine test, when water is turned into the completed reservoir.*

If the test thus far applied has been utterly inadequate and worthless, all the sage conclusions, drawn by the defense as to the sufficiency of pointing up, to stop the leaks, are also worthless. Given several thousand feet of wall which leaks to the alarming extent portrayed by protestants' witnesses, which, with its icy winter coating, looks like a Niagara, when viewed half a mile away—assume also that there is a measurable flow of 1,000 gallons per day between various stations into and through the wall (besides the incalculable flow) from the miniature pools, arranged by the Burr commission (for they are baby pools in comparison with the great reservoir lake that is to be, we hope), who can say where and to what extent the wall will leak, when that small inland sea, with a depth of  $26\frac{1}{2}$  feet, is pressing against it? How therefore can anyone predict that pointing the face, when the wall has been completed, will be the

sovereign and complete remedy for leakage? If prediction may be ventured, and a prediction based upon something known and determined, it may, with far more reason, be asserted that, inasmuch as pointing up the back face of the wall, has not rendered that face impervious to the water, pointing the front face will not make the front face impermeable to water. "The back of the wall was pointed up," and the defense insist earnestly upon this fact, (Brief for Eng., p. 69), as the bank filling progressed. Yet the pointing of the back, plus the silted material from the bank filling has not prevented leakage through the wall, from the petty rain pools, forming behind the wall or from the water in the Burr trenches.\* Pointing and back filling have not stopped the leakage from the back to the front; and therefore pointing will not stop the leakage from the front to the back. The contract requires all parts of the wall to be equally well constructed and pointed.

It is true that one of the protestants' witnesses (Mr. North) did say that the leakage would be stopped by pointing, but his testimony shows it was such pointing as he was describing, that would be needed to close up the leaks effectually, and that he referred to such leaks as had been seen and noted. Mr. North's exact words are that if the pointing were to be done "by raking out the joints and clearing out the old mortar to a sufficient depth, and then filling with good sand mortar," *every leak that had been detected* would be stopped permanently. North describes the kind of pointing he had in mind. "In pointing, a joint is raked out to a certain depth and cement mortar,—or the mortar is often specially prepared,—is forced in very strongly into the joint, and struck with a tool so that it shows for a great distance that it is a pointed

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\*Some of the bank filling actually came through the wall, at different places, and on different occasions.

wall" (559). The retaining wall had been "plastered", not "pointed", and the plastering would not have been done, had further pointing been intended (549, 560). Alden also told Hill what sort of pointing would stop the leakage that had been discovered (see his interview with Hill, p. 54, former brief), and it is the kind of pointing that North describes. As was said in the former brief (p. 61), the strength and impermeability of the wall should lie "in its mass—as a monolithic structure." The defence, as we said, seem to fancy that there is something talismanic about pointing the face. But as they still insist that pointing up is all that is required, a few words must be added to show how inadequate such treatment would be.

Pointing up will never reveal where a leak, not previously disclosed, will appear. North in effect says this when he says that proper pointing would stop a leak that had been *found*. Our contention is that, as the wall has never been and never can be properly tested until there is the full depth of water in front of it, and as the leaks which will be disclosed when a proper test has been applied, cannot be discovered and noted until that test is made, pointing the leaks heretofore noted by Alden, if the pointing be indeed of the proper kind, will close those leaks only, but will not guarantee immunity against numerous other leaks when the reservoir is filled. If it were not for the hair-splitting methods of the defence, they would at once agree with us upon the proposition which we have so often urged : Complete the westerly reservoir, fill it with water, draw off the water after the lapse of a sufficient test, if the wall leaks, and point wherever necessary, provided it is apparent that pointing and not reinforcement, is the remedy. It is hardly conceivable that any prudent business man would hesitate a moment before deciding upon this course. The obvious purpose of the contract in providing that the final payment

should not become due until ninety days after the completion of the reservoir and its acceptance by the Aqueduct Commission, was to give the Commission a reasonable opportunity to make this essential test.

It is sophistically urged by counsel for the defense that the face and retaining wall, built with sand mortar, display the same defects as the wall in which mortar mixed with screenings is used (p. 64). If this were so, would the retaining wall be any better; would it leak less, because another stretch of wall leaked also? But the face and retaining wall, so far as they are built with sand mortar, do not leak to anything like the degree that the wall built with mortar screenings leaks. The testimony as to exactly what portions of the face and retaining wall were built with sand mortar comes from Ulrich alone, and his uncorroborated assertions merit little reliance, as he ordinarily "thinks," "believes," and is never positive. Alden, in his report of January 16, 1902, mentions only one leak in the face wall (station 13.00). No other leaks are noted until station 23.89 is reached, where, unquestionably, crusher screenings were used in the mortar in lieu of sand. Alden's report of December 22, 1902, which we are said to have slurred over [although we set forth in full in our brief (pp. 34-35) the report of April 27, 1903, which mentions it], refers to wall "extending approximately from station 17.50 to 20.50." Part of this wall was wet, but no specific leaks are found or spouting water observed. While his reports of April 27 and July 17, 1903 (both of which we quoted in full), speak of a few stations north of 21.50, it is not until stations 20.74 and 20.79 are reached, that he finds leaks of sensible dimensions or spouting water, and these stations lie in the territory where, even according to Ulrich, screenings were used in part. But, as Alden's examination progresses southward, beyond



debateable frontiers, into the region where undeniably the dust of the rock-breaker was substituted for sand, he reports numerous leaks of perceptible dimensions ( $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{3}{8}$ , 1 in. in diameter), and many spouts of water. Re-examination of Alden's reports, in the light of counsel's criticism, only emphasizes the contrast between the face wall and the long stretch of wall to the south, extending over thousands of feet, where the screenings were used instead of sand. Leakage is marked, is measurable, consists of numerous jets of spouting water, southward of the point where, it is agreed, the use of the screenings commences. Again, if any part of the wall built with sand mortar leaked, the causes are patent, and none of them benefits the defense. Alden swore he understood the sand used in the face wall was inferior and Ulrich did not deny this. On the contrary, it receives a sort of tacit confirmation from Ulrich, who testified that he was led to the adoption of crusher screenings upon the suggestion of Read, the contractors' superintendent, because the sand was getting low, probably inferior, also. Burr reported no measurable leaks in the face wall. This was a much thinner wall than the heavy retaining wall, and in view of the great unnecessary excavations made by the contractors behind it, and of the inferior character of the bank-filling, it would not be remarkable, had it leaked as badly as the heavier masonry to the south. It must be borne in mind, also, that Fteley and Craven, in moving the site of this core-wall, intended to reinforce it with an embankment upon the water side, should such reinforcement become desirable. Wegman's testimony, set forth at pp. 114-117 of our prior brief, is eloquent in this connection. The contractors blasted the solid rock out twenty feet and more behind the toe of the face wall, and commenced to fill this great void with rubble masonry. Wegman put an embargo upon this lucrative scheme. "I decided that I would increase the wall



two feet (from 6 1/2 to 8 1/2) so as to make it strong beyond any peradventure, and then I instructed the superintendent of the contractors that in such cases he must make *earth embankment* back of it, which would probably not cost one-tenth of what the solid masonry would." This plan—to blast out great voids in the rock behind the wall and to fill with masonry at great profit—having been interdicted by Ridgway and Wegman's vigilance, the big voids created by the blasting had to be filled, with unprofitable bank material. How poor this filling was, is half-tempidly told in the Burr reports. The full story appears in our previous brief. The wonder is that this thin retaining wall did not leak far worse than it did—as badly as the heavy masonry put up with mortar made of crusher screenings. If the defense can find consolation in the condition of the face wall, it is welcome to do so. But this unwillingness to meet the real issues, this Parthian mode of defense, to flee, yet appear to fight, will not avail.

In our previous brief we conclusively proved that the use of gneiss screenings had its genesis in the desire of Hill and Ulrich to save the contractors the cost of proper sand ; that gneiss\* rock contains feldspar and mica, both, ingredients to be avoided in hydraulic mortar—the former because it is soluble, the latter because it is flaky and slippery, and will not make a good bond. The prevalence of mica in the screenings was shown by many witnesses, including a chemist of the highest repute, who subjected the screenings to a chemical analysis, which disclosed that their total content of free silica was 35%, as against the 95% found in ordinary sand, the remaining 65% of ingredients being deleterious. We showed also that the gneiss rock of the reservoir site "varied greatly in tex-

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\* One of the briefs for the defense says : " Gneiss rock has the same constituents as granite." But gneiss is stratified and the mica is in laminae; granite is homogeneous.

ture", running from ordinary gneiss into mica-schist, extremely rich in mica, and that it would not be possible to find a cubic foot of the screenings which could fairly be said to be "representative" of the screenings crushed at the reservoir site, during a period of three years. The utter lack of uniformity in the screenings was established by men practically conversant with the work at the reservoir since its beginning, and is apparent in Alden's reports. No one had a greater abhorrence for mica than Professor Burr himself. He would shun it as he would avoid a reptile; it was "prejudicial" to mortar; and "micaceous material should carefully be excluded from the screenings." Although all our witnesses found it abundantly present in the screenings, and engineers, inspectors and workmen frequently complained of it, Professor Burr could not find any except the most infinitesimal quantity in a "cubic foot of screenings" said to be "representative," although taken from *one* pile, which Black is said to have visited at the reservoir in July, 1903. But good vision and common sense are quite likely to be the endowments of the ordinary man, and perhaps the ordinary workmen know better than the scientist how mica works in mortar. \*

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\*Black does not report that he found no mica in the mortar.

In an article in the *Eng. News*, July 24, 1902, Mr. Thomas S. Clark, resident engineer in charge of construction of Manhattan R. R. Power Station, 74th St. and E. R., describes the results of his tests for tensile strength, of briquettes of sand and Portland cement, and of stone dust and cement. The sand cement briquettes were stronger. "The results", he says, "are as might be expected, the stone dust being so much finer than the sand, more cement is required for a given amount of stone dust to produce the ideal state of coating completely every particle with cement, and filling every void. If the stone of the concrete contains dust, it has not the same effect as adding more sand, because, as shown, dust mortar is weaker than sand mortar for the same proportions. One might better increase the amount of cement, as well as decrease the sand, but this increases the cost of the mass. \* \* \* All of the stone dust used in the *concrete* of the power station came from the excavation of the site. This rock contained a certain percentage of mica, but the fracture was very sharp. A small per cent. was quartz. The presence

The record of a few tests made by Black from this so-called "representative" cubic foot, and a few tests made by Professor Richardson from small samples recently gleaned by him, are presented as proof of the excellent quality of the mortar which can be made from screenings. Black appears to have demonstrated to his satisfaction, that it is superior to Cow Bay sand, and it is a serious question whether the city should not intervene and exercise its proprietary rights over this Golconda of architectural wealth that has been discovered at Jerome Park, for the contractors ought not to appropriate any more of it than is required for the completion of their contract. The defense also found a letter written by Ulrich to Hill in May, 1903, setting forth the satisfactory results of "some of the tests" made by Bettels, the cement tester at the reservoir. We then brought to light the complete record of all tests made by Bettels, which included a large number indicating utterly deficient tensile strength in the mortar made from screenings, and have shown that this deficient mortar was actually used in building the wall. Our brief carefully analyzes the results separately obtained by Black and Richardson, presumably by the use of the same methods and contrasts them with the remarkably dissimilar results obtained by Bettels, with mortar that actually went into the wall under criticism. Bettels' results were also shown to be discrepant with themselves and unreliable, and it is to be observed that, while in the laboratory tests, briquettes are usually more carefully made, Bettels' laboratory tests are, almost invariably, inferior to his mortar box tests (MacF.'s brief, pp. 39, 40). In our former brief, we said :

"The discrepancy in their results (Black and

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of mica being objectionable on account of the smooth surface presented to the mortar in the concrete and its low compressive strength, the stone carrying a large per cent. was rejected for use." This last sentence is in accord with the overwhelming testimony of our witnesses, as to pernicious effects of mica in mortar.

Richardson's) suggests either the unreliability of the screenings or of the tests themselves. \* \* \* The great disparity tends to invalidate the tests or to establish a marvelous lack of uniformity in tensile strength. When Bettels' tests are taken into comparison, the differences are so startling as to arouse suspicion. Bettels' highest results for 7 and 30 days for a 3 to 1 mixture are 118, and 181.5. Bettels' tests on many occasions reveal a tensile strength so low as to discredit the screenings altogether, and Bettels tested the screenings from which mortar was actually made.

"Either Black, Richardson or Bettels has made some great mistake, or the samples of screenings were tampered with before the tests were made, or the screenings during the past three years have varied greatly in character, as all our witnesses declare. From such divergent results no one can fairly pronounce upon the superiority of screenings over sharp clean sand free from loam. The doubt is fatal to the substitution. *The city is entitled to such sand as the contract and specifications call for, or it must be proved beyond reasonable question, by a practical unanimity of expert opinion and tests, that the screenings are superior.* When we take into consideration the proof that the screenings contain mica, which all engineers look upon with aversion, the further proof that no authority has sanctioned gneiss rock screenings, and the evidence that the wall made with screenings mortar leaks copiously, the conclusion is fairly compelled that the use of the screenings was radically wrong. The real test of the wall will come when there is 26½ feet of water in front of it. Until that test has been made, not a dollar of the reserved fund should be paid. Upon the fallacious assumption that the westerly reservoir would be completed this present winter, the Burr report suggests a somewhat similar test."



Counsel for the contractors argues that our failure to off-set the Richardson tests by tests from other experts, is "a most eloquent, though silent, confession of defeat". This argument is easily refuted, because, while it was possible for us (as we did) to get small samples of the screenings actually used a year or two ago, for submission to chemists, it was not possible to secure sufficient quantities of the earlier screenings for the making of briquettes; and secondly, because at the very time when Richardson was testing a limited number of briquettes of the screenings now at the reservoir, Bettels, from presumably similar material, with a wider range of opportunity, was recording results, *every one of which is below the minimum standard*, and it is to be pre-supposed that Bettels, under Ulrich's guidance, was straining every nerve to obtain the best possible results. Is it not indeed remarkable that Richardson's few samples should average, for seven days, 220, 224.224; whereas all of Bettels' recent tests (our brief, p. 89) average, for the same period, ; 48.8; 65.6? Our observations upon the "personal element" as a factor in making and testing briquettes, which are based upon the unanimous testimony of the experts, (although exception is now taken to them, in the arguments for the defense,) are strikingly vindicated in an interesting article by Professor Porter, of Lafayette College (Vol. 35, No. 10, Eng. News, Mar. 5, 1896). The article contains a "Table Showing Tension Tests of One Part Cement, Three Parts Sand Mortar, made by Different Persons, in accordance with their Understanding of the Method Proposed by the Committee of the Am. Soc'y. Civ. Eng'rs." *The average results of laboratory tests for tensile strength of briquettes made by each of nine experts range between 68 and 252. It is interesting to note that Richardson's tests stand next to the highest in the list, his average being 225.*

Complaint is made by the defense that we set



out in our brief a list of Bettels' inferior tests, and it is said repeatedly, in varied phrase, that "it is impracticable to arrive at a fair conclusion by picking out the low tests and leaving out the high", that we should consider "the average" (Brief for Eng., pp. 34, 38). It is said also that we omit all reference to Bettels' 2 to 1 tests, which we do, for a reason recognized by all engineers, that they furnish no criterion of the strength of 3 to 1 mortar. The mortar which, according to his tests, was deficient in tensile strength was not improved, because other mortar tested by him gave better results. Since Bettels found screening mortar which was actually used in building the wall, to test, for 7 days, 30, 35, 40, 43.6, no doctrine of averages derived from tests of other mortar could possibly improve its physical quality or impart added tensile strength to it. If the mean temperature of New York City throughout a year, or series of years, is found to be, say 60°F., it would surely be hazardous for a person to whose constitution it would be fatal to be exposed to a zero temperature, to assume that he could safely live in the balmy climate of the metropolis. If, out of a large number of barrels of cement, a certain percentage proved to be worthless after test, no engineer would think of using the worthless ones on the theory that the average test of the entire lot was up to the standard. He would know that the worthless barrels would give bad results and would reject them altogether. Somewhere in the wall bad mortar was used, and a chain is no stronger than its weakest link.

An unsuccessful attempt is made to show that Bettels' numerous tests exhibiting defective tensile strength in the screenings, were really not tests at all, and should be discarded from consideration. Thus Counsel for the Engineers says: "The pages on which these tests are recorded, read with Bettels' testimony, will show the Commissioners quite clearly that in these instances no test could be

obtained. There had been some carelessness in preparing for the test or some accident happened" (p. 37). There is nothing in Bettels' testimony to authorize the disregard of these low tests, but there are pencil remarks of Ulrich's in the record book, evidently made long after the Bettels' entries, and evidently made for the purpose of breaking their just effect; and these pencil notes of the Division Engineer were, when the record was offered, expressly agreed not to be considered as in evidence (M., pp. 1687, 1688). Had Counsel for the Association thus perverted the evidence, his conduct would have been attributed, in more or less veiled language, to an evil heart. We, however, shall say only that, after careful reperusal of every word of Bettels' testimony, there is nothing in it to warrant the language quoted from counsel. It is a weak case that needs such tactics. Dismissing Ulrich's comments, there is nothing in Bettels' testimony or records to imply that his low tests did not accurately exhibit the tensile strength of the mortar.

It is upon Bettels' tests that the mortar actually in the wall must rest, and these tests condemn no inconsiderable part of it. As these screenings were challenged, it was natural that the defense should have tests made, with the aim of sustaining the dust, but with what result, has been already set forth. What fair-minded tribunal could, in view of the evidence, pronounce the mortar, in the wall already built, to be better than Bettels' tests indicate—part fair, part woefully deficient? As Hill and Ulrich were swift to yield to the contractors' request and allow the use of screenings in place of sand, the *onus* falls upon the defense of establishing that mortar made from screenings from the crushed gneiss rock found at the reservoir, is superior to, or certainly as good as, mortar from "sharp, clean sand free from loam", and this burden has not been met.

But assume, for argument's sake, that our diagnosis of the cause of leakage is incorrect, the

phenomenon to be explained—the leakage—still remains unaccounted for.

The chapters in the brief for the defense which treat of embankments are, in reality, little more than diffuse and evasive confessions of the truth of our charges that the specifications have been flagrantly disregarded, unless the plea that the chief engineer had plenary authority to dispense with the specifications altogether, is to be accepted in justification of his course. That he had no such power has heretofore been shown (p. 9; pp. 11-14, 93, former brief).

As to the embankment just east of Gate House, 2, where, as was shown in the previous brief, is the most critical point along the reservoir periphery, because of the sudden and rapid descent of the land toward Van Cortland Park, it was charged, and the charge substantiated by copious citations from the testimony of witnesses, that neither the inner nor the outer bank was built in 6-inch layers, nor rammed, nor rolled, nor was either constructed of the required material, but enormous boulders were dumped into the banks from the cars which ran over the trestle built across the ravine. It was shown also that a large part of the trestle was left in the outer bank. Fully to appreciate the evidence in condemnation of this bank, recourse must be had to the former brief. The defense do not deny that the bank was not built in six-inch layers, nor do they claim that it was rammed or rolled, but argue that it was puddled, and that the chief engineer had authority to deviate from the specifications, although they do not show the slightest necessity for his doing so. They argue also that the trestle can do no harm, as it is imbedded in the bank, and is not subject to influences which may cause its rapid decay, yet the specifications require the removal of all roots, stumps, timber, &c. All our witnesses and some of their own, including Professor Burr, disapprove of this trestle, and no one has testified that trestle is proper bank material.

*The indictment as to the boulders is glossed over.* We proved conclusively by an overwhelming mass of testimony, which need not be rehearsed at this time, that the boulders which went into this bank were, on many occasions, so large that the side of the car had to be taken out to permit of their removal from it, "the door," being too small for the purpose. Alden, Sykes, Ridgway, McPherson, graphically described these stones, and McPherson told of the extraordinary precautions he was forced to take to prevent some of these boulders from coming in contact with and smashing the top of the brick arch of a pipe chamber, built from gate house 2 as a drain for the reservoir. He told also how Hill on one occasion said he "did not like it," how Hill started for the office, as he supposed, to order Ulrich to stop such work, but that it was not stopped. Unless all these witnesses have been guilty of falsehood, this bank must be condemned. A lame attempt is made in the brief for the engineers to show that Ulrich once or twice gave orders to McPherson, when the latter complained to him, to make the contractors move the steam shovel and get proper material for the bank, *but neither Ulrich nor his counsel contends for a moment that Ulrich required the improper material which had already gone in, to be removed from the banks.* McPherson swore that Ulrich, *several times*, told him to let these boulders go, and the testimony of all our other witnesses on this point distinctly corroborates McPherson, and proves that Ulrich paid no heed to their remonstrances or complaints. As we pointed out, in our earlier brief, Ulrich did not dispute McPherson's statements. It is difficult to read with patience the feeble and evasive sophistries offered as answers to conclusive proofs, but it is to be assumed that the Commission will study the record. It is not too much to say that no candid mind can familiarize itself with the testimony upon this subject, and remain unconvinced, that stones as large as a cubic yard



or even larger, were many times dumped into both the inner and the outer bank at this point, despite the language of the specifications, which forbids the use of stones larger than three inches in diameter (see pp. 95-105 of our former brief).

The so-called "puddling" of this embankment, which the defense says was substituted for the form of construction positively required by the specifications, was not puddling at all. It is the sheerest perversion to force the language of specification 62, in relation to timber, scaffolding, bracing in arches and deep trenches, which may be left in the work but not charged for, so as to apply it to the trestle, left in embankment. Craven made the meaning of specification 62, and its inapplicability to embankment, perfectly clear, when he told Mr. MacFarlane, that timber needed in masonry construction is sometimes permitted to be left in *deep trenches*, where it is not liable to decay (p. 307). The idea that this clause (62) relates to timber improperly put in an embankment, in which all timber, trees, stumps, &c., all perishable material—everything but earth and stones not exceeding three inches in diameter—was forbidden, is simply ridiculous. Engineers who use such arguments may be naturally assumed to have been no more intelligent or honorable in the prosecution of their work.

It is expressly admitted by counsel for the engineers that the specifications as to embankments "were discarded" by Hill, in building the bank or fill behind the retaining wall along Sedgwick avenue (pp. 74, 75, brief). It is admitted that the fill could have been rammed, but it is said that as there was a long narrow ditch or trench to be filled, it could not have been rolled. Counsel concedes that rolling was entirely practicable when the filling rose beyond the so-called narrow trench, and reached the height of the natural surface of the adjoining ground, and then proceeds gravely to argue that inasmuch as Hill could



not "roll" in the deep trench, there was no reason why, when the fill rose to the point where rolling was perfectly practicable, Hill should adopt the "method prescribed by the specification she had discarded." This reasoning is about as extraordinary as the work under criticism. In the first place, if rolling was impracticable in the deep trench, there was all the more reason for the exercise of strict care by the engineer to follow the specifications in other particulars. It was his duty to see that the bank was built in 6 in. layers, of carefully selected material, that it was rammed or tamped, and, as soon as the situation of the ground made resort to the use of a roller practicable, he should have returned to the method laid down in the specifications. This embankment is very long, and part of it extends behind the face-wall, where the rock was unnecessarily blasted out to a distance of twenty to thirty feet. As Wegman properly forbade the filling of this space with masonry, good bank material, properly built in, was of the utmost importance. In the second place, if Hill felt justified in building the bank in the narrow trench by the "puddling" process—it was not genuine puddling—he should have used all precautions to keep out improper material. Alden, McPherson, Sykes, Fleming, say that large stones were dumped into the trench, and that loose rock and debris left by the masons who constructed the wall were not removed (see pp. 106, 107). In the third place, this bank filling, especially behind the face-wall, was condemned by the Burr special committee, which said "This space \* \* should be filled and puddled with the *best quality of puddled material, and with the greatest care.* This does not *appear* (Professor Burr's favorite word, again) to have always been the case." Could there be plainer condemnation of Hill's conduct, at this place, than we get from his own admissions, the arguments of his counsel, and the final slap at his work administered by the Burr committee?

In our former brief we characterized the fill along Kingsbridge road for 750 feet as an outrageous disregard of the specifications. Ulrich's work here is so indefensible, that excuse or palliation being out of the question, it is said that this bank was built by an outside contractor, and that when knowledge of the fact that great boulders were dumped into this bank came to the attention of the chief engineer, he ordered the work to be stopped. The outside contractor was Bart McDonald (said to be a brother of John B. McDonald), who was allowed for months, with Ulrich's knowledge, to dump these stones into this bank. Alden, Baldwin, Blauvelt, McKeon, Craven testified how the work went on, for months.

*Ulrich knew all about it* for months, as he admits. Q. "Were you aware of the fact that this material was dumped there?" A. "Yes. \* \* *I observed the character of this material.*" Q. "When was this stuff dumped there?" A. "*Well, commencing some time in Dec. (1900), I should say, and running until March, 1901.* \* \* Then the Chief Engineer ordered it to be stopped." This fellow who thus testifies was the division engineer in charge of a great work. No wonder when he came to report about the trench dug in this bank he, too, suppressed the fact that it was full of great stones, and, far from being impervious to water, hardly checked the natural flow of water.\*

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\*It is said by engineers' counsel, (at page 73,) that Craven built "a long stretch of the outer bank between stations 85 and 92, in entire disregard of specification 52 \* \* \* by simply dumping the material and leveling it off with scrapers." If Craven erred, as the defense claims, it is no excuse for continued error. Baldwin says that this stretch was built in the ordinary six-inch layers and the material spread with the scrapers, which is altogether different from Ulrich's method of simply dumping all sorts of material, good and bad. He says also that the material which went into Craven's banks, was all in conformity with the specifications (590). This part where Baldwin says scrapers were used was only a small portion of the banks built by Craven and neither Craven, nor other witnesses admit that Baldwin is correct; but if he were, the precedent would not justify Ulrich's work. The contrast between building a limited

The bank remains to this day. The excuse Hill gives for not ordering it destroyed, is, that there is still talk of ripping out the core-wall construction, at this point, although two commissions of engineers have separately declared this core-wall and embankment construction to be perfectly safe.

All our remaining charges go by default. There is a confession by the engineers, that the contractors converted to their own use \$1,806 worth of iron pipe belonging to the city, which the contractors had delivered at the reservoir, and for which they had been paid. There is also a hang-dog admission by Ulrich, that when he discovered the pipe had been abstracted, he did not, (as his subordinate Blauvelt suggested that he ought to do,) deduct the amount from the next month's estimate or insist upon prompt restoration or the delivery of an equivalent. He confesses that the contractors "jollied" him along, so that two years and a half elapsed before pipe was received in its place. This is probably one of the "admissions" we should have foreseen would be made. It is a singular coincidence, and not altogether a happy one for Ulrich, that the contractors were not requested to replace the pipe until after the District Attorney began his inquiry into proceedings at the reservoir. Hill swears he did not learn of the abstraction of the pipe before the District Attorney's inquiry, but Ulrich swears that he acted upon Hill's instructions in not at once deducting the amount.

In neither of the briefs for the defense can be found any contradiction of Wegman's testimony regarding the undue excavation back of the face

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portion of bank in six-inch layers, with scrapers, instead of rollers, all the material being perfectly proper, and building long stretches of bank by simply dumping material—stones and boulders of all sizes—and washing with water, is so marked that nothing more need be said.

wall. The core wall first planned between stations 10 and 17.50 would have involved the unnecessary excavation of a high hill of solid rock. Craven and Fteley therefore agreed that it would be more economical to move the location of the face-wall to the rock-front, making it a facing or lining of the rock, (hence the term face-wall), bond it close to the rock, and, if it should be found necessary, fortify it with an embankment on the water side. This change, as has been shown, involved no departure from the contract or specifications and was strictly in the city's interest. After Craven's transfer to Katonah, Ridgway, one morning, reported to Wegman, the succeeding division engineer, that the contractors had excavated this rock mass behind the wall, and had "commenced to fill in from the line of the face wall to the solid rock, which would have made a face wall something like 28 or 30 feet *on top*, instead of 2 feet", and forty feet at the base. Wegman's interdict put a quietus upon this expensive proceeding, and his decision establishing a "neat line" 2 feet back of the rear of the face-wall, had Hill's ostensible approval. This was on April 30. But two weeks earlier, a collision had occurred between Read and Wegman, when Wegman, observing that the contractors were blasting too deep for the central division wall, "probably 4 or 5 feet more than was necessary", directed the men "to keep to grade and not waste masonry by putting it in trenches where it was not needed". Read objected, exclaiming: "You are trying to save masonry". Wegman answered: "That is what I am here for." One would suppose that an engineer of Wegman's qualifications and integrity was, especially in the light of such incidents, the right man in the right place, and that his zeal in the city's behalf would meet with commendation, but in place of words of praise or encouragement, came an order exiling him again to Katonah, whence he had come to supersede Craven,



Within a short time after Hill's accession to the office of chief engineer, there were rapid changes in the division engineer's office, which we are criticised with attributing to some common inspiration, with our usual cynical readiness to impute evil. The curiously interesting march of events is highly suggestive of design. Craven was Fteley's division engineer, and, upon Fteley's retirement, was made acting chief engineer. He was soon superseded by Hill (January, 1900), who had as his sponsors, Senators Hill and Murphy, Craven being reduced to the grade of division engineer and, in March, relieved from command at the reservoir, without assigned or assignable cause, although he sought explanation from Chairman Ryan and from Hill. But two facts are known, even if they seem to be unrelated to what had happened. Craven, by changing the site of the face-wall, had saved the city the expense of rock excavation over a distance of 750 feet; and he had refused the contractors' request to substitute rock dust for sand. Craven went to Katonah March 14, 1900, and Wegman came from there to the reservoir, to assume Craven's place. His days at Jerome Park were few, for on May 16, 1900, he resigned the command to Ulrich, who had applied for the position on April 24. In Wegman's brief two months he had succeeded in frustrating two performances which would have been exceedingly profitable to the contractors, blasting out rock and filling in a wall twenty to thirty feet thick on top, or forty feet at its base, behind the face-wall, and checking excessively deep blasting at the foundation for the central division wall. He was not praised by his superiors for his zeal in the city's interest, but was remanded to Katonah, to the place just made vacant by Craven's transfer to rapid-transit work. Then came Ulrich. Within fifteen days after his appointment, the price allowed to the contractors for broken stone is *doubled*, al-



though Hill tells us that he thought the previous price was low when Craven and Wegman made their estimates, and that it never "*occurred*" to him to suggest a rise in price, until Ulrich's arrival. Simultaneously the prices of other materials are advanced, a systematic recalculation of all rock and earth excavation from the beginning,\* begun, for the purpose of ascertaining whether the contractors had received a sufficient allowance; allowances for slope made that were never made before; and the rock dust, which Craven told McDonald he would not use, soon substituted for sand in mortar. Add to this interesting series of incidents that Hill had been acquainted with McDonald for over twenty years and that Ulrich also knew McDonald prior to May, 1900; in fact Wegman first met Ulrich in McDonald's office; that Ulrich permits the contractors, at their pleasure, to remove from the reservoir, pipe for which the city paid and never thinks of its restoration, or of the deduction of the price from the estimates until stimulated by an inquiry about the pipe from the District Attorney. Is it, we ask, an unfair inference that this dramatic array of events has its origin in some unity of purpose? When separate pieces of mosaic are found, if fitted together, to form a pattern, is not design to be inferred? As Lincoln said in one of his debates with Douglas, speaking of the Dred Scott decision, "If we saw a lot of framed timbers gotten out at different times by different workmen—Stephen and

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\* It is said that our argument that Ulrich could not alter the allowances made in earlier estimates involves the fallacy that no mistake, however serious, either in favor of or against the city could be corrected, perhaps for years. Engineer's certificates, like agreements, are susceptible of change for fraud or mistake. But no such case was before Ulrich for consideration. He deliberately altered earlier cross-section sheets, deliberately certified to work not done, deliberately advanced prices for material sold and paid for at much lower prices to the city, long before his administration began; consequently the argument of counsel has no relevancy.

Franklin and Roger and James,—and if we saw these timbers joined together and exactly make the frame of a house, with tenons and mortices all fitting, what is the conclusion? We find it impossible not to believe that Stephen and Franklin and Roger and James all understood one another from the beginning, and all worked upon a common plan.”

What we said at the outset of this brief, we repeat at its close, the case for the Association has been conclusively proved. The leakage in the “water-tight” retaining wall is a fact that cannot be eradicated, the “plashing water”, the “frozen masses of ice”, are not the offspring of heated imagination, but have been heard and seen, and are testified to by reputable and unimpeached witnesses. The grave discrepancies between the Burr reports as to leaks, and Alden’s contemporaneous reports, and also their striking coincidences, have been noted. Nor has any one of the distinguished engineers called for the defense, with Burr’s exception, ventured an opinion whether, if a 200 feet space of wall, under existing conditions, leaked 1000 gallons a day, that would be much or little, while our witnesses have declared that the leaks they have seen are sufficient to show the wall to be unsafe. It has been shown that the Burr-Freeman-Hering trenches could not furnish any reliable data as to how much the wall would leak, with a pressure of 26 1/2 feet head of water against it. It has been established also that there were long portions of this wall to which no test whatever was applied by the Burr committee, and that no genuine test can ever be made until the reservoir has been completed and the water let in. And the simple duty we have urged upon the Aqueduct Commission is, to make that test, the only reliable test, before it parts with any of the reserve fund. Pointing up leaks heretofore detected under the two or three feet pressure of a few pools behind the wall, will not prevent other leaks,

nor assure us immunity from many leaks when the reservoir is filled. The dictate of duty is in accord with the suggestion of simple common sense. We have shown that screenings have, without warrant of right, been substituted for sand and that the specifications have been grossly disregarded in the building of embankments. Beyond and, in a sense, above all our other criticisms, is the unanswerable charge of gross and unwarrantable delay. For over three years nothing was done at Aqueduct North, yet, although this utter stoppage of work was inexcusable, the contractors have been rewarded with advanced prices. We have shown that no real consideration for the increased prices given the contractors by the agreement of October, 1902, has been returned to the city; for it was the definite agreement of the contractors, that if their contract was put upon the eight-hour basis, as it was by that October agreement, and they were paid an equivalent of the change in labor cost, which was also agreed to, they would finish the westerly reservoir by August 31, 1903, and the easterly reservoir by August 31, 1904. That solemn promise has been broken in respect to the westerly reservoir, nor has there been the slightest indication at the easterly reservoir since the October, 1902, agreement, either by the introduction of an enlarged plant, by any augmentation of the small labor force or by any other symptom of energy, of any intention to redeem the *present* pledge—to complete the easterly reservoir August 31, 1904. This latter promise cannot possibly be performed, because engineer Cook has conclusively established and the records of the Aqueduct Commission show that, under the best conceivable auspices—with unbrokenly propitious weather and all other circumstances favorable, the rock and earth cannot be excavated from this easterly reservoir before August 31, 1907.

No attempt has been made, in this brief, to cover the entire ground traversed in the former brief, and this must be considered as a brief in reply to the arguments submitted by the counsel for the contractors and the engineers.

From all the testimony, and from the arguments, it is respectfully, but firmly, submitted that the payment of the \$200,000 should be refused, properly to conserve the interests of the City.

J. HAMPDEN DOUGHERTY,  
of Counsel for The Merchants' Association.

## Appendix.

### SOME ERRORS IN BRIEF FOR ENGINEERS.

Alden, in his examination before the Aqueduct Commission, prior to the appearance of counsel for The Merchants' Association, is said to have "testified" (page 24). He was not sworn, and, while we think there is no inconsistency between his statements at that hearing and his subsequent testimony, counsel inadvertently conveys the impression that he was under oath, when he was making a statement not under oath.

That Alden in a few weeks should have been convinced that the bad mortar caused leaks is not at all remarkable, especially as celebrated experts for the defense begin by saying that mica is a most vicious element in gneiss screenings and should be carefully excluded, and end by arguing that it is, perhaps, not so bad after all. But Alden did *testify* that he was to be given an opportunity to re-examine his unsworn statement, but never enjoyed that privilege.

Briquettes "breaking in clips" is said to be the result of "mere accidents", having no "relation to the quality of the materials used" (43). Ulrich himself testified that when they break in clips it is because the material is defective (p. 1181). A good briquette, properly made, and intended to bear the requisite stress, should not break, unless it received extraordinarily rough usage.

It is said that Ulrich did not testify that Hill directed him to make *weekly* tests, and counsel quotes Ulrich's testimony that Hill instructed him to have tests made *frequently* (p. 47). But see p. 1178 of the minutes, where he was twice asked if he had been instructed to make *weekly* tests and said Yes. See also his report to Hill as to "some of the tests", which says: "I have taken tests every week", &c.

Counsel says that Ulrich "was evidently very uncertain whether tests of screenings had been made between October, 1900, and April, 1901", of which no record was kept (p. 48). He was no more uncertain about this than about any other testimony he gave. Our earlier brief cited proofs of his uncertainty, and of his manifest incapacity for his office.

It is stated that Alden in his report of April 26, 1902, complained of "some broken stone" used "as sand", "on the preceding morning", as of bad quality (49). Alden's complaint was of *all* the stone. It says: "Yesterday morning *the* broken stone, &c.", evidently meaning, as the context shows, all the car-loads of stone delivered that morning at the works. Had it been some only which he criticised he would not have said that in Ulrich's absence, not wishing to stop the work, he felt constrained to permit the use of the better of the stuff, all of which was bad.

It is further said that Ulrich "went out and looked at these particular screenings, and condemned them himself" (49). Ulrich does say "a day or so after that I examined the screenings, and found there was a lot of foreign material that had been shovelled into these



car-loads of screenings, dirt and débris of all kinds, and the inspectors were informed at once to condemn that and not to use it", but Alden and other witnesses say that this very material was *in fact* passed by the Division Engineer *a few days later* (M., 218).

Page 84. It is said that the crushed stone has accumulated in large quantities, in advance of use for concrete, chiefly because of "the great delay in deciding what changes must be made in plans for the bottom of the reservoir." Even assuming the original plans were inadequate, as counsel contends (which we do not concede) the great delay in deciding upon changes was the fault of the engineer recently in charge. The question of changing the plans for treating the bottom of the reservoir first arose in the spring of 1903, certainly after October, 1902. In October, 1902, all the crushed stone to be delivered, as per contract, had already been accumulated on the ground (897) and \$120,000 had been allowed for it (p. 859), so that the accumulation of crushed stone, in large quantities, in advance of its use, was not due to delay about plans.

(89) It is claimed there was no secrecy about Ulrich's changes in the cross section sheets. Blauvelt does not say so, and, upon cross examination, it was with the utmost difficulty that any fact as to sheets was extracted from Ulrich. After things are proved at great length, engineers' counsel says they are admitted, or that there was no secrecy about them.





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